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Lighting Service

THE art of illumination has made tremendous advances during the last twenty years, mainly on account of the improvements effected in the electric lamp. And yet it seems that more people than ever are wearing glasses.

Is the latter fact due to "eye consciousness" (to use a hackneyed modernism), *i.e.*, are people paying more attention to their sight than before, or is the increased use of artificial light responsible?

The human eye can bear many hours of daylight without discomfort, but needs a certain amount of rest, and it is certain that in these days the period of rest has been considerably curtailed. Much more time is spent under artificial light owing to the change in habits. Consider, for instance, the amount of reading which is done nowadays, as indicated by newspapers with colossal circulations, floods of cheap "literature," and thousands of twopenny libraries.

This being the case, it is imperative that artificial light shall be properly used, otherwise it may do incalculable damage to the sight. Whose job is it, then, to ensure this correct use? The answer seems to be, the users of light themselves. They are provided with good lamps and fittings, and surely it is "up to" them.

Unfortunately in this, as in other matters, the public cannot be left to itself; it needs tuition and guidance. Without this, people will either persuade themselves that an inadequate lighting installation is quite sufficient for their needs or they will go to the other extreme and use too much light in the wrong way, which is just as bad for them.

The matter is of sufficient importance to justify national education—in the schools and by means of pamphlets on the lines of those issued by some of the Government departments, *e.g.*, the "Road Code." This seems to be out of the question at present, although it must be said that more attention is being given by the Home Office to factory lighting—and the new Factories Act deals with this important matter.

In the absence of State effort the lamp makers have shouldered the burden through their Lighting Service Bureaux in London, Glasgow and Leeds. In these establishments the latest developments in the lighting art are demonstrated to select audiences—particularly representatives of electricity supply authorities and contractors, who are in intimate touch with the public and, therefore, able to secure the application of the principles and methods which they have studied at the Bureaux.

Some of the things which are to be seen at the London Bureau are mentioned in an article in this issue, and we urge readers who have not yet paid a visit to do so as soon as they can. They are bound to derive profit—and not a little entertainment from what they will see there.

Apart from the demonstrations of the correct and incorrect use of light, the exhibits include the latest developments in lamps and cognate matters from the research laboratories of E.L.M.A. members. This is another direction in which the latter are serving the public need.

All this is not pure altruism, although we should say that a large proportion of this estimable quality enters into the matter. As in all other directions, the makers of lamps have to keep on improving their products, for, after all, gas is still a competitor in the lighting field—and there are others. Moreover, they want to sell more and more lamps. As to the last, they could rely upon their excellent commercial propaganda, examples of which we have recently described, but are not content to do so.

Therefore, we consider, they are entitled to a great deal of credit for what may aptly be termed their enlightened self-interest, and should receive the backing of other sections of the industry in their joint effort with E.D.A.—the "Better Light—Better Sight" Campaign.

The Shop Window

ALL the time we are out for originality and unconventionality in shop-window displays and demonstrations. There is a danger of a sameness creeping into the electricity window, yet there is plenty of room for adaptation of displays to accord with local surroundings, human and otherwise. On the whole, however, electrical shop windows are a credit to the supply personnel, though if they were a little more enterprising, nay, even daring, they might draw a bigger crowd than they do. It is non-electrical windows that draw a mob by such low-down tricks as showing a collection of humanly occupied artificial silk stockings until the police have to intervene and order the dropping or raising of the curtain. Our go-ahead young electrical window-dressers will be interested to learn that for cooking cakes in a window, and thus causing a crowd of forty people to assemble and cause an obstruction, a shopkeeper in the Old Kent Road has been fined fifteen shillings. Having urged them here to make their displays exceptionally life-like, alluring and instructive, we feel that we should be failing in our duty did we not warn them of the danger that they run. Yet it may put a feather in one's cap if one draws the crowd! Press reports do not say whether the cakes were being cooked electrically, or whether it was the cook and not the cooked that attracted. While we leave this for E.D.A. to investigate for the good of all, we still urge our undertakings to make their windows absolutely the last word in attractiveness.

Magnus Maclean

FOR many men now in middle life, and some well beyond it, the announcement of the death of Professor Magnus Maclean will have revived memories of the early training received under him during the quarter of a century of his work at the Royal Technical College, Glasgow. Doubtless, like many another, he owed much to the atmosphere and influence—perhaps we may be permitted to remember it as a charm, or even a spell—of Lord Kelvin, for in his early days William Thomson recognised in Maclean a student of outstanding ability, and selected him for collaboration in experiments, research and lecturing. That collaboration lasted for a considerable period. Though Magnus Maclean relinquished his university and college activities some fourteen years ago, his influence has been continued, notwithstanding his eighty years, amongst a later generation of young students, who owe much to his well-known books on electrical subjects.

Selected Stations and the Grid

COMPLAINTS are from time to time voiced by engineers of undertakings receiving bulk supplies that owners of selected stations get more than their fair share of advantage from the grid. It is equally clear, however, that many of the latter have quite a contrary opinion. While these are given the option of buying energy from the Central Board at either the grid tariff or at their own cost of production, the benefit of choice is often illusory, as the cost of generation at the best stations is naturally less than that of the average represented by the grid tariff. Moreover, the undertaking's own cost of production applies only to kWh actually generated in its selected station, whereas the operation of a station in the interests of the scheme as a whole may prevent its being run in the way its owners regard as the most efficient for local purposes, as Mr. Sayers points out in an article in this issue. Thus, to take the case of the West Midlands J.E.A., to which we referred last week, short-time importations of load from the grid at the grid tariff would cause the overall cost to be appreciably higher than that obtainable under independent generation but for the provision of Section 13 of the 1926 Act, which gives an undertaking the right to claim that the amount it pays to the Board shall be adjusted annually so that it does not exceed the cost of independent generation. Last week we referred to the disappointment expressed by the J.E.A. that its hope of savings due to grid connection had not materialised. In commenting on this we omitted a reference to this annual adjustment that guarded it against an actual loss, which was necessary to complete the case. That there should be this protection is only right, as selected stations are operated so as to benefit other undertakings whose generating costs would presumably have been higher than the grid tariff.

Co-ordination in London

SOMETHING over two years ago six of the electricity supply companies operating in the western districts of London came together as London Associated Electricity Undertakings, Ltd., with the object of co-ordinating their systems and pursuing a common policy. The combination took the form of an actual merger. Now the large company undertakings serving the eastern area of London have embarked upon a scheme for closer working, details of which appear on another page. In this case the companies retain their separate identities; a committee of representatives is to be formed to administer the scheme. The arrangements provide for the interchange of directors; the interconnecting of systems where this is likely to prove advantageous; a common policy in dealing with consumers; the bulk purchase of materials; the co-ordination of accountancy systems and staff; and the utilisation of capital expenditure to the best advantage. The companies intend to carry this policy further, for Mr. P. D. Tuckett informed the City Company's shareholders last week that an endeavour was to be made to avoid overlapping with "London Associated."

Public Lighting Competition

WHEN we visited Folkestone this week to see the special public lighting installation we felt that a tremendous effort must have been made by the gas industry to produce such excellent results—in many cases comparable with those of the electric schemes. This impression may have been received as the result of the activities of men who appeared to be maintenance staff, or of a concentration of gas lighting at such vantage points as the conference headquarters. Electrical men seemed to be pleased at the efforts of the competing industry, saying that the greater the light intensity given by the gas people, the easier it is for the electrical industry to make a good case on the score of economics. We find no fault with this attitude in itself, but we hope that electrical men will not be tempted to sit on the fence of content. As in other development fields, the main issue in connection with public lighting must still be inter-industry competition.

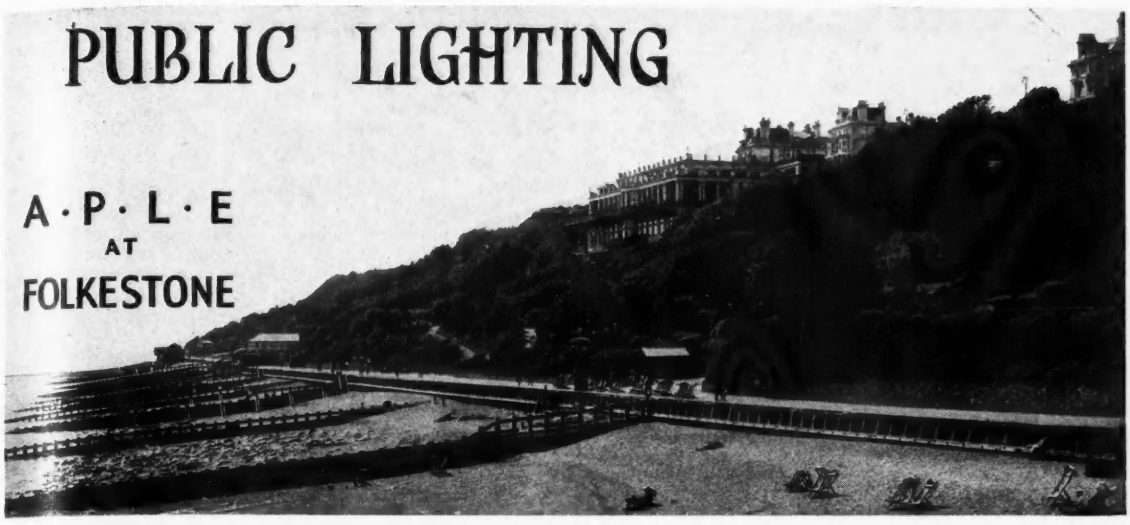
Motor Control

THE type of starter required for a motor depends upon the duty which the latter is to fulfil. Manufacturers often complain of the difficulty of meeting a purchaser's requirements because essential particulars are not sent with the inquiry. Far more consideration should be given to the effect of the speed-torque curve of the driven machinery when being run up. This influences the choice of motor as well, as Mr. V. F. Pestereff shows on a later page. Rupturing capacity may also decide the most suitable kind of starter. Another point is that every motor has a specified overload rating for definite periods; but full advantage cannot always be taken of this if the protective gear is not of a type to allow the extra capacity to be utilised for dealing with peaks without overheating. By attention to such points capital expenditure can often be cut down, and at the same time reliability can be improved.

Growing Up

WE have to thank Mr. H. M. Drake, past-president of the E.C.A., for break-away from tradition. Even nowadays it is too often said that the electrical industry is still in its infancy. In a recent address, reported in the *Electrical Contractor*, Mr. Drake tore off the swaddling bands and boldly declared that the industry was "comparatively youthful."

PUBLIC LIGHTING



The annual conference of the Association of Public Lighting Engineers was held at Folkestone from September 6th to 9th, the total attendance being in the neighbourhood of 700. Of the six papers presented half related to electric street lighting and these are reviewed below. A comprehensive exhibition of street-lighting apparatus was arranged and many Folkestone thoroughfares were illuminated by special systems designed to show lamps and equipment in operation and enable comparisons to be made. A number of these installations are illustrated.

Presidential Address

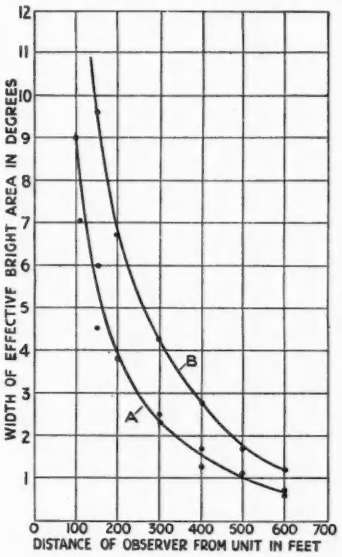
IN his address on Tuesday last the president, Mr. C. I. Winstone discussed the question of what constitutes good illumination at varying speeds of road travel without headlamps. From personal investigations he had found that, given good visibility, a generous "F" classification of 0.07 ft.-candle was safe up to 40 m.p.h., "E" class of 0.1 ft.-candle up to 50 m.p.h., and "D" class of 0.2 ft.-candle up to 60 m.p.h. If there were one central authority governing expenditure for lighting main roads, many miles of bad lighting could be improved by the savings from cutting down extravagant illumination of relatively unfrequented roads.

Mr. C. I. Winstone, president of the A.P.L.E.

He disapproved of the requirement in the B.S.S. by which minimum illumination was ascertained at a test point equidistant from two lamps, whereas light could be focused to give the illumination asked for in a tender to the detriment of general surface brightness and resulting in a patchy appearance. Good visibility and road brightness were not to be obtained by focusing the light on the test points but on the area of the roadway near the next lamp. This would mean having the beam 10 deg. instead of 18 deg. below the horizontal for a spacing of 150 ft., perhaps resulting in the B.S.S. test point illumination being reduced by 50 per cent. The ultimate result, however, would be a great improvement.

Mr. Winstone was also not in favour of the 50 per cent. depreciation allowed under the B.S.S., which tended to cause maintenance to be neglected; the maximum should be 30 per cent. He knew of tenders which provided for cleaning lamps at intervals of as much as from two to four months. Last November he had tested at intervals the absorption of light through eight pieces of 21 oz. clear flat glass exposed in Westminster. The initial loss was 9.5 per cent.; at the end of seventeen weeks' test, the figure was 18.2 per cent. In this test there was no heat to bake the dirt as in a lighting fitting and no traffic to disturb the dust in the street.

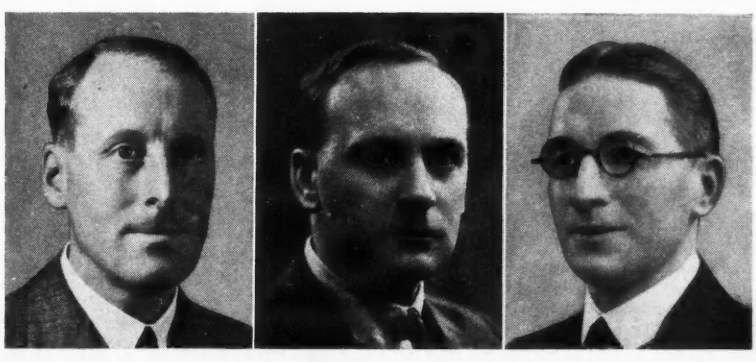
Electric photometers could be used with confidence to ensure that illumination was being maintained, but too few lighting officials possessed one. He believed that the great advances made in public lighting had been due to theorists working in conjunction with experienced practical men.



Curve connecting effective angular width of bright area with distance of unit (see page 332).

Street Lighting Experiments

A paper was submitted by Dr. S. English and Mr. E. Stroud (Holophane Research Laboratories) describing "Some Further Experiments in Street Lighting," in which it was urged that the final test was good visibility, to which uniform illumination, high road-surface brightness and elimination of glare were only contributory factors. In towns general illumination which permitted objects to be seen by direct vision was of primary importance, but along main roads with fast-moving traffic easy silhouette vision was required. The authors expressed the view that none of the instruments available measured visibility, since the eye must not be shielded from glare and the field of view must not be restricted, and that its value could only be deter-



Left to right: Mr. G. H. Wilson (G.E.C.), and Dr. S. English and Mr. E. Stroud (Holophane), authors of two of the papers

mined by the unaided eye. The relationship between surface brightness and glare indicated that the latter did not seriously impede vision until the light source—line of sight angle was less than 15 deg. Possibly good general illumination could be combined with high road-surface brightness and freedom from glare by directing a beam of light at from 1 to 2 deg. below the horizontal and then having a zone of reduced intensity (88 to 87 deg.) followed by another beam maximum at 75 per cent.

Experiments on a length of roadway lighted by five lanterns spaced 153 ft. apart showed that 500-W filament lamps gave test-point readings of 0.117 ft.-candles (Class "E") with a diversity factor of 21, and that 125-W mercury lamps gave 0.052 to 0.085 ft.-candles (Class "F"); diversity ratios, however, fell to between 7.5 and 11 due to change in shape of the

Messrs. T. Catten, G. S. C. Lucas and R. Maxted, authors of the paper on "Planned Street Lighting"

light source. With 150-W sodium lamps in inverted enamelled reflectors, the classification rose to "E," with a diversity factor of 19, while the use of refractor panel fittings gave Class "D" at a diversity of 7.

Tests with vertical mercury lamps in 160 and 180 deg. asymmetric refractors and horizontal lamps in panel refractors also brought the illumination into Class "D," the last giving the higher test-point figures of 0.32 and 0.34 ft.-candles and also appreciably better visibility. Even on wide roads, if a 5- or 6-ft. overhang were adopted, better visibility was obtained by using axial rather than non-axial (160 deg.) fittings.

Fittings for unidirectional motor tracks should send as much light towards the oncoming driver and as little as possible in the direction of travel—the opposite of that recommended on the Continent.

Modern Electric Lamps

Mr. G. H. Wilson (G.E.C. Laboratories) recorded the results of new research on the design of installations in his paper "The Application of Modern Electric Lamps to Street Lighting." A good installation, he said, should reveal objects in their clearly recognisable form. He then described experiments that demonstrated the influence of post position and height in securing a natural appearance. The relationship between the distance of a fitting from an observer with the effective angular width of the bright area formed by the unit were given in the form of two curves (p. 331) (A) for substantially uniform appearance of the road and (B) for just tolerable unevenness. Small variations in power of source, type of light distribution and road surface did not cause large variations in the conclusions reached. As a driver came round the bend of a curved road, any adjacent pair of lighting units must, in order to be within the limits of tolerable unevenness subtend at his eye an angle not exceeding half the sum of the two patch widths taken from curve "B." The author gave constants for an optimum installation.

The second part of the paper dealt with new designs of lighting units for existing lamps and new developments in lamps and fittings for use with them. Details were given of the new horizontal-burning 250-W and 400-W mercury lamps, the 80-W and 125-W mercury lamps and the 400-W luminescent powder lamp. In the last (which will shortly be available) the primary light source is the inner bulb of a 400-W mercury-cadmium discharge lamp designed to operate with the normal 400-W choke coil. The outer bulb is internally coated with luminescent powder. An isothermal bulb (which is larger than the normal for a mercury lamp) enables the whole of the coating to be operated at an even temperature, the powder retaining its efficiency during life. Another model is to be available for ordinary discharge lamp fittings.

About half of the total intensity came from the arc itself in a horizontal direction. The chief function of the powder was to absorb invisible ultra-violet radiation and to convert it to visible light of such a colour as to give a close approach to daylight of the overall light of the lamp. Any absorption of visible light by the powder is completely compensated for by the additional light obtained by luminescence. The initial efficiency with the powder was 37 lumens per watt, as with a clear outer bulb, whilst the red-ratio (the proportion of the total light passing through a Wratten No. 25 red filter) was 5 to 6 per cent. compared with 1 per cent. for 250- and 400-W lamps and 2 per cent. for 80- and 125-W lamps.

Planned Street Lighting

A paper by Messrs. T. Catten, R. Maxted and G. S. C. Lucas (B.T.H. Co.) defined a well-planned lighting installation as one in which the road surface was a continuous ribbon of light sufficiently bright to prevent interference from extraneous light, with the vertical backgrounds adequately lighted and interference glare reduced to the minimum. Planning is the adjustment to the conditions of a particular case of the choice of light source and lantern unit, and the mounting height, spacing and position of units above the road surface.

By means of films the authors presented street lighting problems from models produced in a studio, using cartoon photography to illustrate quantitative results. One film showed the importance of correct location of the lantern unit, emphasising the difference between indoor and road lighting. In the latter case the quantity of light available was only from a tenth to a hundredth of that available for indoors and it was thus better to use the light to illuminate the backgrounds against which objects could be seen in silhouette.

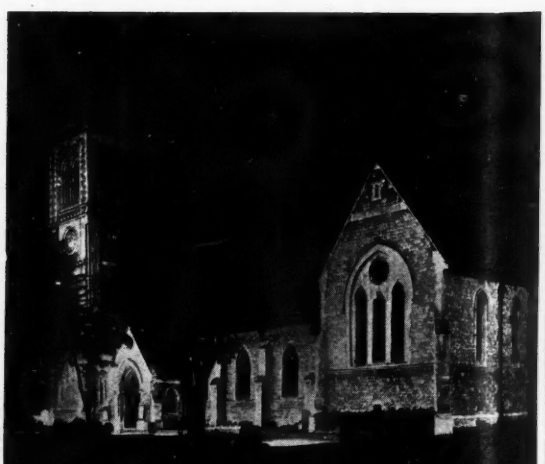
Various other aspects of the subject were emphasised in an entertaining manner, showing the advantages of this method of presentation.

Social Events and Annual Meeting

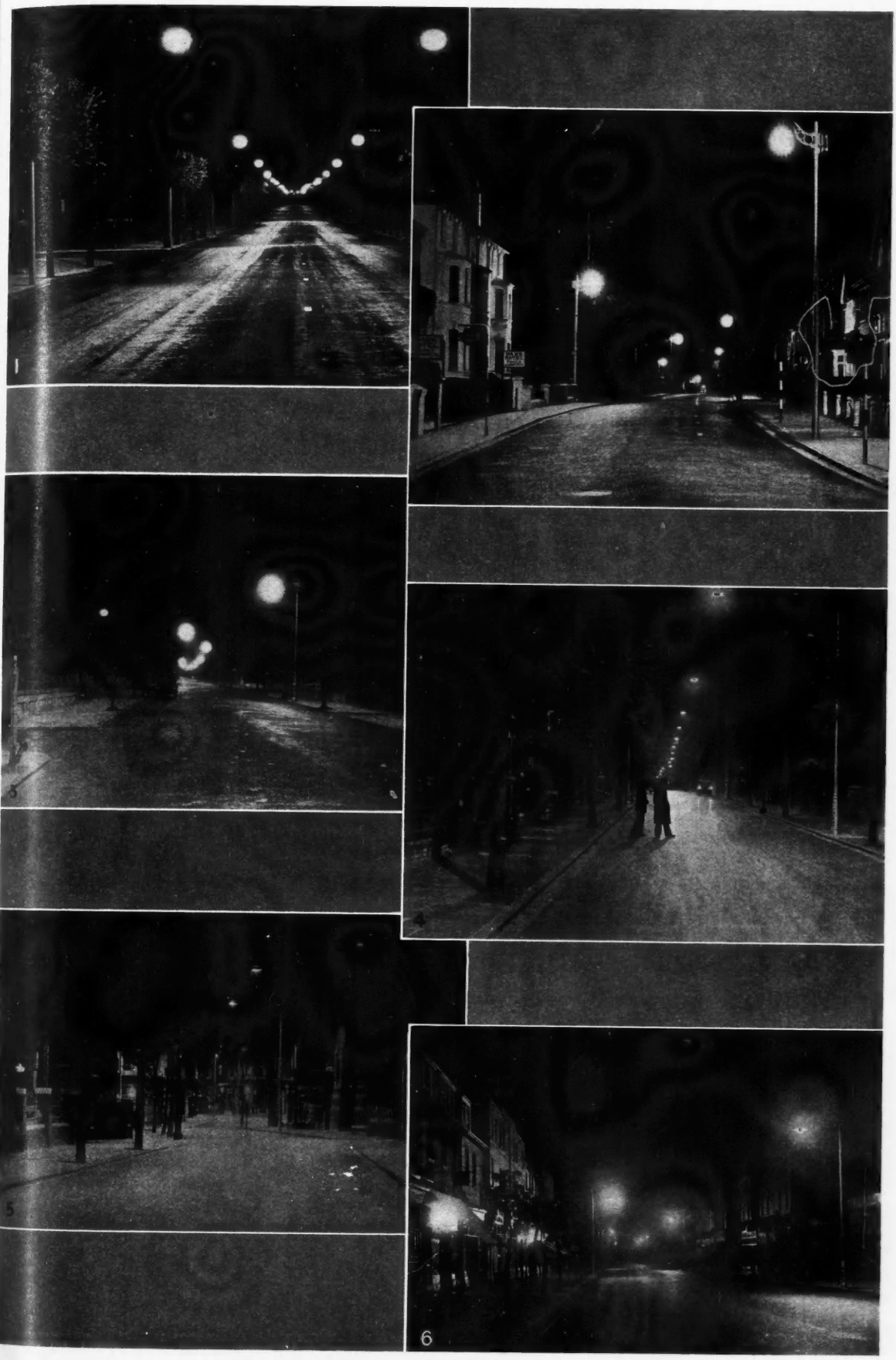
The local arrangements were in the hands of Mr. P. G. Hobbs (electrical engineer to the Folkestone Electricity Supply Co., Ltd.), Mr. G. le Diamond (the gas lighting engineer), and Mr. E. L. Allman (the borough engineer). On Monday evening there was a reception and dance at the Leas Cliff Hall by invitation of the Mayor of Folkestone. On Tuesday the Gas Light & Coke Co. entertained the delegates to luncheon at the Royal Pavilion Hotel and the Folkestone Electricity Co. issued invitations to a conversazione on the evening of that day. The annual banquet was held on Wednesday last.

At the annual general meeting on Monday, held under the chairmanship of the retiring president (Mr. E. C. Lennox, M.I.E.E.), it was reported that the membership was increasing and that the funds were in a very satisfactory position. Councillor Benwell (Bournemouth) extended an invitation to the Association to hold its next conference in Bournemouth and the President said this would be brought before the Council. Later in the meeting it was stated that the conference would be held in Bournemouth next year.

The result of the ballot for officers and members of Council was as follows:—President: Mr. C. I. Winstone (Gas Light & Coke Co.); Vice-President: Mr. C. H. Woodward (Bournemouth); Members of Council: Mr. H. W. Gregory (superin-



Christ Church, Folkestone, floodlighted by means of Siemens lamps and equipment



Demonstration Street-lighting Installations at Folkestone

(1) Shorncliffe Road: 150-W sodium lamps, 50-ft. roadway, double-span suspension (joint display by Philips, Wardle, Holophane and Brighton Lighting & Electrical Engineering Co.). (2) Cheriton Road: 400-W mercury lamps mounted on tall poles with "uplift" brackets (Revo and Philips). (3) Sandgate Road: Horizontal 400-W mercury lamps in new "Mercra H" lantern (B.T.H. Co.). (4) Christchurch Road: 400-W horizontal mercury lamps in special reflectors to eliminate glare (G.E.C.). (5) Guildhall Street: 400-W horizontal mercury lamps in lanterns with cut-offs of 75 or 82 deg. (Met.-Vick). (6) Sandgate Road: 400-W mercury lamps in "Bi-way" lanterns (Siemens)

tendent, Northern Area, North Met. Co.), Mr. H. V. Emptage (public lighting superintendent, Margate), Mr. W. J. Bache (borough electrical engineer, Cheltenham, who is also this year's President of the I.M.E.A.), and Mr. J. Sellars (Manchester).

The President, in asking his successor, Mr. Winstone) to take the chair, said he had had a very happy year of office and expressed his appreciation of the help that had been given to him by all the members of Council. Telegrams were sent to His Majesty the King and to Dr. Carpenter, who was seriously ill.

A suggestion was made by members from the North of England that the Association should meet again in the North, as there had already been two successive conferences in the South. The President said that the Association was bound by circumstances to meet in Bournemouth next year, but the Council wished to go North again for a Conference and consideration would be given to such a visit in 1939.

The Street Lighting Demonstrations

Various applications of discharge lamps

JUDGING by the street lighting demonstrations arranged for the conference the keenest competition seems still around sodium *versus* mercury electric-discharge lighting. Mr. Wells of the Engineering and Lighting Equipment Co. asserted that sodium was "getting away with it" on the score of better visibility and definition and lower running costs.

On the other hand Mr. Ritchie, of General Electric Co., Ltd., assured us that lighting authorities were becoming more reluctant to wed themselves to sodium which had no future because of its monochromatic property, whereas with mercury there was a good future because of the colour possibilities.

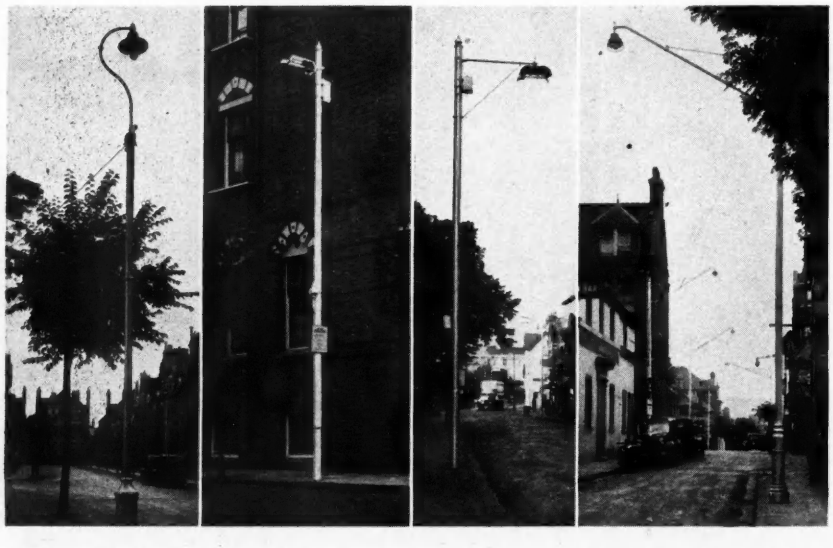
Dr. English (Holophane, Ltd.) said that sodium regarded as a victory for itself the introduction of the horizontal mercury lamp. An interesting comment by the British Thomson-Houston Co., Ltd., in connection with its horizontal "Mercra" lamp is that a horizontally disposed line source of light lends itself to simple optical control with the result that a lantern can readily be designed to give the most effective distribution for street lighting purposes.

Speaking mainly with reference to the installation on Shorncliffe Road, Mr. Hughes, of Siemens Electric Lamps and Supplies, Ltd., said that the sodium lamp should have a cut-off fitting, but Mr. Sayers, of Philips Lamps, Ltd., did not advocate this. The great point, he said, was excellent visibility due to definition.

Great controversy prevails at the moment on the question of test point illumination, and many of the manufacturers who quote the various class illuminations for their installations discounted such methods of classification for street lighting; indeed, we heard one manufacturer say how easy it would be to put all the intensity at the test point.

Things on which everybody agreed, however, were that good street lighting was the easiest way of advertising electricity because it led to improved shop lighting by competition, which idea extended to the home, and that the psychological aspect and daylight appearance of lighting equipment plays an important part in any commercially installed scheme.

Left: A "Liverpool" lantern with a 400-W horizontal mercury lamp in Guildhall Street (Met.-Vick.). Centre: A 2-piece concrete column and bracket design seen at Folkestone (Concrete Utilities). Right: Mercury lighting standard in busy shopping centre—Sandgate Road; 400-W lamp in Bi-way lantern (Siemens)



Left to right: Small discharge lamp on swan-neck bracket in side street—Westbourne Gardens (B.T.H.). Revo lantern for sodium lighting in Alexandra Gardens; 150-W lamps. Bi-Multi fitting for sodium lighting in Bouverie Street (E.S.L.A. Co.). Good example of side-street lighting equipment with very long overhang to road centre (G.E.C.)

It must have been difficult for the lighting engineers in planning the demonstration schemes to take into consideration psychological questions. By way of alternative schemes, however, they seem to have succeeded.

The electrically lighted roads at Folkestone are in three main groups. First, there are what may be termed three main town thoroughfares running east to west and accommodating in various widths mainly high-class residential and shopping centres; secondly, there are two commercial streets with mixtures of offices and shops; and thirdly a group of side streets. Shorncliffe Road and Cheriton Road we regard as one of the main streets. The Shorncliffe Road end affords a good development field in that it has a 50-ft. carriageway and is heavily bordered with trees. Double span suspension has been adopted and each lighting line is 12 ft. from the curb. The average spacing is 125 ft. while the mounting height is 24 ft.

The "Philora" sodium lamps are housed in lanterns incorporating Holophane refracting panels, and Dr. English referred to this type of fitting as the favourite at the moment. Six or so types of lanterns employ similar panels and the result is a wide light-spread across the road. Brighton Lighting and Electrical Engineering Co., Holophane, Ltd., Engineering and Lighting Equipment Co., Ltd., Wardle Engineering Co., Ltd., and Philips Lamps, Ltd., have all co-operated in this Shorncliffe Road sodium lighting installation.

The Cheriton Road continuation of this thoroughfare is much reduced in width and is bordered by older classes of property—in some cases rather drab. Mercury lighting is employed with 400-W lamps in Revo lanterns embodying prismatic and lenticular glass panels in copper frames and internal stainless-steel reflectors. The spacing is 138 ft. and the height 25 ft. A branch of Cheriton Road to the station has a 27-ft. roadway and is also mercury lighted with 250-W Sieray lamps in Holophane bowl refractor lanterns. The diagonal spacing is 135 ft. and the height 24 ft.

Sandgate Road is near to and parallel with the front and at the west end from the Hotel Metropole it is 34 ft. wide and is bordered by high-class lofty hotels and residences. It has mercury lighting and the B.T.H. has installed its new "Mercra H" horizontal lamp fittings which are characterised by the control cut-off. Mr. Phillips claimed that this horizontal fitting yields 45 lumens per watt and that the 5 W consumed by the magnetic control is responsible for an additional effective 2,000 lumens. The maximum spacing of 150 ft. is easily permissible and the light source height is 25 ft.

Further east along Sandgate Road from Castle Hill Avenue to Christ Church, where the buildings are smaller and less uniform, the B.T.H. has installed vertical 400-W mercury lamps in "Dilen" lanterns with circular reflecting-prism type glasses. Although we were assured that the two types of B.T.H. fittings were not installed particularly in consideration of the characteristics of the sections of road, but merely as two alternatives from the capital cost point of view, we feel that there is a definite suitability in each case. It is a little unfortunate that the road surface has been recently laid and has not yet acquired that polish which affords maximum visibility.

On the remaining part of this thoroughfare Siemens have similarly adopted alternative schemes. From Christ Church to Bouverie Place there are "Bi-Way" lanterns which have reflective prisms on the house side to throw some light back across the road. Beyond Bouverie Place there are "Regent Sieray" lanterns. Both types employ 400-W mercury lamps vertically installed at 125 ft. spacings and 25 ft. above the road. Towards the east end the road widens out into a fashionable shopping centre.

Bouverie Road varies very considerably from west to east. At the west, where the roadway is 30 ft. and bordered by large trees, the G.E.C. has installed at 150-ft. spacings "Di-Fractor" type lanterns with 400-W mercury lamps. The uplift brackets from the poles have every appearance of "dodging" the trees, but Mr. Hart assured us that the only consideration was the use of shorter poles; also the same scheme is employed further east along the street where there are shops and no trees.

Further east to Guildhall Street there is a change to sodium by the Electric Street Lighting Apparatus Co., using 150-W lamps horizontally in "Bi-Multi" reflectors. Faith in a principle is strongly suggested in this adaptation of the Croydon-born multi-mirror principe to discharge lighting, and we cannot help feeling that the sodium lamp is not entirely responsible for the elimination of a certain drabness at the east end under artificial light. The spacing and height are 150 ft. and 25 ft., respectively. Guildhall Street, the commercial centre, is a Metropolitan-Vickers job, with two sorts of lanterns. The new "Kingsway," with its reflecting prism glasses, was introduced originally for sodium, but is now used for mercury lamps horizontally. The prism glass renders any reasonable spacing permissible, and therefore affords an interesting comparison with the other type of fitting on the road ("Liverpool") which, by reason of its definite cut-off, has a spacing limit of 120 ft.

Tontine Street, with its concentration of small shops has "London Major" lanterns at one end and "Stepney" lanterns at the north end, which develops into a sort of a warehouse street. The spacing is 150 ft. and the lanterns have been installed by the Edison Swan Electric Co., with 400-W mercury lamps and short overhangs at 25 ft. high. We should imagine that this was probably the most difficult road to light because of its irregularity in every way, and the problem was not lessened by the necessity to install the lamps on existing columns or by the riot of bunting and flags. If any lighting engineer doubts the seriousness of discharge lighting effect on colour purely from the decorative point of view he should see Tontine Street.

Among the side-street installations, Westbourne Gardens, a quiet 24-ft. road, is outstanding by virtue of normality of appearance with the new equipment. Swan-neck fittings carry 125-W mercury lamps and these are about the size and shape of a 200-W gas-filled lamp. Alexandra Gardens is merely a 20-ft. to 25-ft. road, but Revo have installed 150-W sodium lamps with good effect. The silvered mirror fittings are installed 25 ft. high at intervals of 135 ft.

Christ Church Road is narrow, but probably worthy of a higher distinction than side road on account of heavy traffic. The G.E.C. seems to have compromised to meet both aspects by the installation of mercury lighting on very long brackets from staggered poles to give a central lighting line. Horizontal 400-W lamps spaced at 90 ft. at the north end of the street afford a good example of high-grade centre-of-town lighting in their cut-off lanterns. At the south end similarly bracketed are 125-W "Osira" mercury lamps in semi-cut-off "Plafractor" lanterns.

In Bouverie Square E.S.L.A. have installed a "Bi-multi" scheme similar to that in Bouverie Street, but with low wattage mercury lamps, and at the corners of the square the application of the principle to acute bends is really good. Siemens have shown the adaptability of mercury lighting to existing fittings to very good account in Cheriton Gardens, and in Claremont Road the Brighton Lighting & Electrical Engineering Co. has made a good case for mercury side-street lighting with 80- and 125-W lamps in the new Holophane "Duo Dome" refractors.

We saw some excellent examples of concrete standards, particularly by the Metropolitan Pipe & Pole Co., Ltd., and Concrete Utilities, Ltd., and Mr. Marque, of the latter concern, stressed that from the economical point of view the concrete maker could do no more by way of artistic design.

Arrangements for the 1937-38 Season

WE have received from the Institution of Electrical Engineers a list of dates arranged for social and other functions during the coming 1937 and 1938 season, compiled from information supplied by the bodies concerned. From this we have extracted the following principal events:—

October 15th.—Institution of Mechanical Engineers—annual dinner.
21st.—Institution of Electrical Engineers—opening meeting (Presidential address).
22nd.—Institution of Railway Signal Engineers—annual dinner-dance.
29th.—Faraday House Old Students' Association—annual dinner.

November 3rd.—I.E.E. Transmission Section—conversazione and dance.
4th.—British Electrical and Allied Manufacturers' Association annual dinner.
19th.—Electrical Trades' Commercial Travellers' Association—annual dinner-dance.
19th.—I.E.E. Meter and Instrument Section—annual dinner.
22nd.—I.E.E. Mersey and N. Wales (Liverpool) Centre—annual dinner.
23rd.—Electrical Industries Benevolent Association—ball.
25th.—I.E.E. Scottish Centre—annual dinner.
26th.—Institute of Marine Engineers—annual conversazione.
26th—I.E.E. South Midland Centre—annual dinner.
Late November or early December.—Radio Manufacturers' Association—annual banquet and ball.

January 17th.—I.E.E. Western Centre—annual dinner.
18th.—I.E.E. North-Western Centre—annual dinner.
26th.—I.E.E. North-Eastern Centre—dinner.

February 3rd.—I.E.E. East Midland Sub-Centre—annual dinner.
9th.—Diesel Engine Users' Association—annual dinner.
10th.—I.E.E.—annual dinner.
11th.—I.E.E. Benevolent Fund—Electrical Engineers' Ball.
16th.—I.E.E. Sheffield Sub-Centre—annual dinner.
25th.—Institute of Marine Engineers—annual dinner.

March 4th.—Institute of Transport—annual dinner.
4th.—I.E.E. North Midland Centre—annual dinner.
9th.—Institute of Metals—annual dinner-dance.

April 28th.—I.E.E.—Kelvin lecture.

May 18th-21st.—Institute of Transport—congress (at Edinburgh).

June 21st-24th.—International Engineering Congress (Glasgow).

E.P.E.A. (Southern Division)

The annual dinner of the Electrical Power Engineers' Association (Southern Division) will be held on October 2nd at Holborn Restaurant, W.C.1. Tickets (members 7s. 6d., non-members 10s. 6d.), can be obtained from Mr. F. H. Smethurst, hon. secretary, Southern Divisional Office, "Tremorvah," Lynton Road South, Gravesend.

The Proper Use of Light

A visit to the Lighting Service Bureau

HAVING already made a study of the publicity matter and methods adopted for the E.D.A.-E.L.M.A. "Better Light, Better Sight" Campaign, we had an opportunity last week of examining some of the "mechanism" of the campaign to which ingenuity of another, more tangible, nature has been devoted.

The occasion was an invitation to inspect one of the fairly frequent reconstructions which E.L.M.A. makes at its London Lighting Service Bureau, Savoy Hill, W.C.2, when the manager, Mr. W. J. Jones, assisted by Messrs. Lingard & Freeth, introduced to our notice some remarkable new lighting arrangements in the architectural lighting studio designed by Mr. R. O. Sutherland, A.R.I.B.A.

The light-selection recorder

The layout has been planned to illustrate the main principles governing cornice lighting and illumination from built-in glass panels. Varied features demonstrate the relationship between architectural design and the most recent developments of light sources.

Particular attention has been devoted to the indirect lighting systems in view of the rapid development made with the electric discharge lamp. It is anticipated that in the future this type of lighting will be widely used for general architectural purposes and enable advantage to be taken of its economy in consumption; it can already be used with advantage in amplifying metal filament installations and in producing a decorative character where coloured illumination is permissible. The features which are suitable for demonstrating the above include sections of cornices and channels, indirect wall brackets and two methods of coving, the latter being described as of the open and closed types.

With regard to the use of luminous panels, attention has been given to the respective merits of direct and indirect lighting. One feature illustrates to architects the application of suitable glazing to these particular methods of illumination and contrasts the advantages of lamping by reduced or multiple lighting points. Together with the above glazing problems opportunity will be given to view the effects of light in connection with rods, prisms, lenses and moulded glass tiles, &c. In addition there are decorative crystal glass plates, set in the thickness of wall plaster. This crystal glass is acid-etched and sand-blasted with a decorative design that is illuminated with coloured light, illustrating the particular property of crystal glass which allows the passage of any colour.

The reflective properties of twelve different wall surfaces are demonstrated by means of a portable lightmeter, the scale of which is projected on to a wall. The properties of fluorescent powders are illustrated by flooding a panel bearing a design alternately with light from a tungsten lamp and ultra-violet radiation. Examples of shelf lighting; a polished plywood ceiling grille with indirect lighting; the illumination of columns from louvred surrounds; and a number of other ingenious devices make the display one well worth visiting.

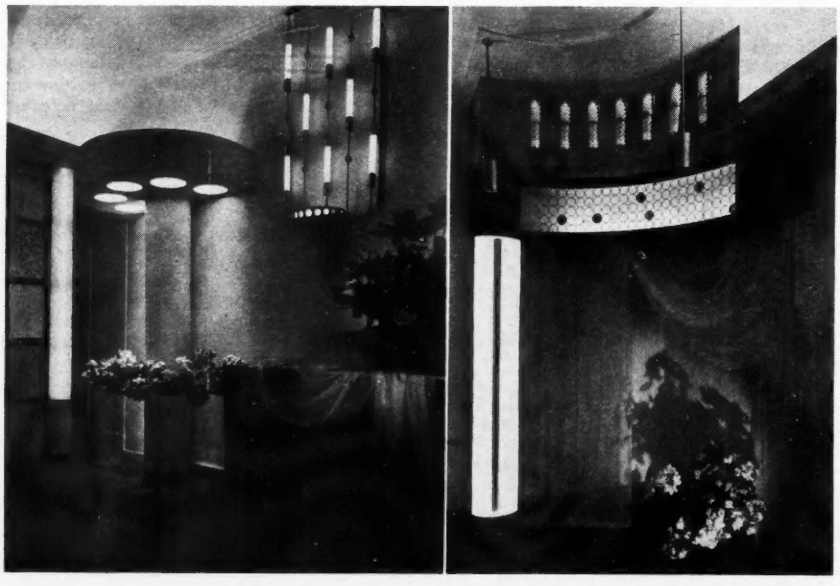
To revert to the Campaign. The Lighting Service Bureau has invented a new game for electrical contractors and supply authorities and their customers. It is (or should be) called "Tracking the Foot-candle" and the equipment consists merely of a lightmeter and the illumination of the room in which the game is played. The rules comprise the standards laid down by the Illuminating Engineering Society for adequate lighting. If the illumination at any point fails to reach the required standard the customer forfeits the price of a better lamp which the contractor provides.

The Bureau's aim is to make the public "light conscious" and to induce every electrical man in contact with the public to carry a lightmeter in his pocket for use on every possible occasion.

A booklet on light measurement is available from the Association. It contains about twenty illustrations showing the application of light in the factory, the office, the store and the home, and in each case the recommended standard of illumination is stated. A simple explanation of the construction, operation and employment of the lightmeter is given.

Another intriguing "stunt" for showrooms is the light selection recorder. The customer is asked to sit in a chair to which a lamp standard is fitted. A book-rest bearing a newspaper is then swung into a convenient position and the customer is asked to adjust the brilliance of the lamp (by means of a resistance) until a comfortable reading light is obtained. Then he or she presses a button and through a slot a card is delivered recording the foot-candle reading selected.

The Bureau arranges lectures to societies and groups in all parts of the country and this activity will continue during the coming season. A new departure is a "potted" talk, with illustrations, developed for the use of supply authorities and contractors. It involves the use of a portable projector with gramophone attachment neatly packed in a suitcase. With this equipment the Bureau supplies a large gramophone record capable of a twenty-five minute run (both sides) on which is recorded the dialogue of a "scenario." The talk is illustrated by a series of about eighty "still" pictures arranged on a film. In spite of the absence of movement on the screen a very effective result is obtained. A simple method of synchronising pictures and dialogue is provided.



Two views of the reconstructed architectural room at the Lighting Service Bureau

The whole of this equipment will be lent to the authority or contractor free of charge, except for the cost of carriage from the Bureau to the locality in which the display is to be staged.

Another form of projector is available by which the readings of a lightmeter carried to any part of a room are shown on a screen magnified many times. This should prove useful for demonstrating the light measurement idea to small audiences.

The official co-operation of the opticians has again been obtained in the continuance of the campaign.

Starters for Induction Motors. By N. V. Pestereff

Selection of types for small and medium-sized three-phase machines

THERE is no branch of electrical engineering in which more misunderstanding exists than in that embracing starting gear for small and medium-size normal industrial motors. By normal industrial motors is meant three-phase induction machines up to about 100 h.p. and 650 V of the squirrel-cage, squirrel-cage high-torque and slip-ring types, required to be started not more than twice in an hour, used for group or individual drives of machines.

The classes of starters available for squirrel-cage motors are shown in Table I, the resulting starting torques and currents being those set out in Table II. Continuous voltage control is not considered further as it can be used economically only where very gradual acceleration, temporary speed control or creeping speeds are required.

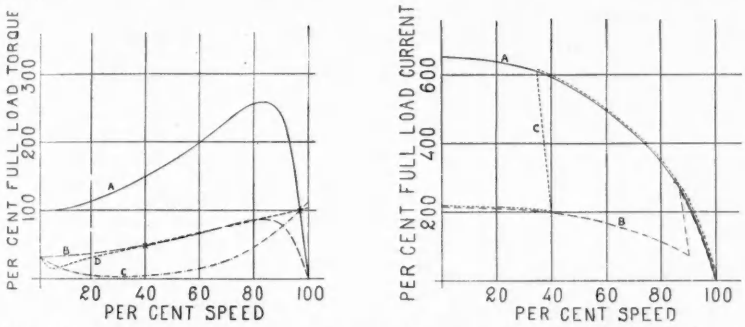
TABLE 1.—CLASSES OF STARTERS FOR S.C. MOTORS.

Direct-on.	Star-delta.	Auto-transformer.	Continuous voltage control.
Push-button, air- or oil-break	Push-button, air- or oil-break	Hand-lever, air-break air-cooled	Inductor-regulator, with solid rotating member
Hand-lever, air-break	Hand-lever, air-break	Hand-lever, air-break oil-cooled	Inductor-regulator, oil-cooled wound moving member
Hand-lever, oil-break	Hand-lever, oil-break	Hand-lever, oil-break oil-cooled	

TABLE 2.—STARTING TORQUES AND CURRENTS (PER CENT. OF FULL LOAD).

Class of starter.	Starting torques.		Starting current. *	
	Normal-torque motor.	High-torque motor.	Normal-torque motor.	High-torque motor.
Direct-on	100	200	450–600	550
Star-delta	33	66	150–200	180
Auto-transformer:				
50%	25	50	120–150	140
60%	36	72	160–220	200
80%	64	128	300–400	350

* The lower figures are for machines having p.f. and efficiency about 2% worse than the higher.



Left: Speed-torque curves for a normal squirrel-cage machine. (A: Switched direct-on to supply. B: With $\sqrt{3}$ V applied. C: Typical load speed-torque curve, instance 1. D: The same, instance 2.) Right: Speed-current curves (A: Switched direct-on to supply. B: Star-delta starting, instance 1. C: The same, instance 2.)

Frequently direct-on starters can be used when other types involving the application of a reduced voltage to the terminals of the motor are considered necessary in the mistaken idea that the starting current is invariably much decreased, forgetting the possibility of a secondary peak when the full voltage is switched on. In the diagram of speed-current curves, when the motor runs up to 90 per cent. of full-load speed with the star connection, a start-delta starter is shown to reduce the peak considerably, but when the motor runs up to only 40 per cent. of full-load speed a star-delta starter has no advantage and the motor should have been of the high-torque type or switched direct-on.

Star-delta and Auto-transformer

For higher capacities than 5 or 10 h.p. the starting currents are usually required by the supply authorities not to exceed 150 per cent. of full load. Nevertheless if the starting torque required does not exceed one-third full load, and if the torque-speed characteristic of the load is suitable, a star-delta starter can be used. If the torque-speed characteristic of the load is not suitable or a higher starting torque is required, a high-torque motor (giving up to 66 per cent. of l.t.) can be used.

Preliminary consideration of the load-speed curve will prevent the putting in of unsuitable squirrel-cage motors and then blaming the starter if the contacts burn or other trouble is experienced. I do not advocate having recourse to an auto-transformer starter if a high-torque squirrel-cage motor can be used. The difference between the cost of an auto-transformer and a star-delta starter in sizes where it might be expected to be used is more than the increase in price of the motor. Further, to gain the same torque with a normal squirrel-cage machine with an auto-transformer starter as with a high-torque machine and star-delta starter an 80 per cent tap must be used (the torque being proportional to the square of the voltage applied) thus drawing 80 per cent. of the short-circuit current (the current being proportional to the voltage applied) and if this is allowed the motor might as well have been thrown direct on to the supply, as the peak so caused is a momentary one.

Push-button operated, oil-immersed d.l. starter with h.r.c. fuse chamber and ammeter (J. A. Crabtree & Co., Ltd.)

The cheapest type of starter is generally the air-break hand-lever operated, but with direct-on starting a good model of this type is slightly more expensive than a push-button operated air- or oil-break starter.

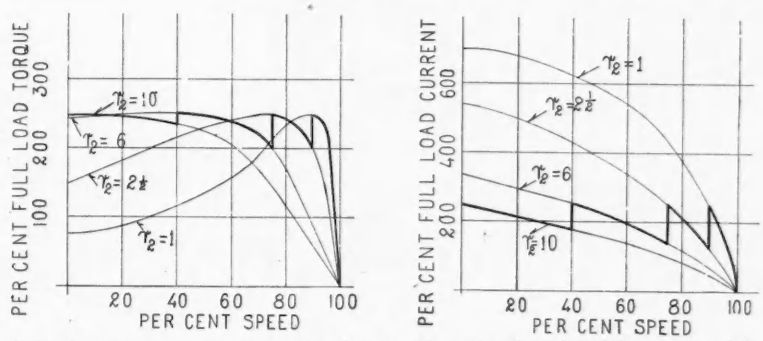
Direct-on starters up to 10 h.p., due to the introduction of the push-button, form a special case. For higher capacities push-button starters are not competitive and the relative merits of hand-operated oil immersed gear and air-break gear need only be considered.

Air-break contactors are now used for the heaviest of duties, *e.g.*, rolling mill control, and so are quite suitable for small motors.

The oil-immersed vertical-break starter, which is a development of the contactor type, offers several advantages, apart from its compactness, at the same price; the vertical motion enables guides to be introduced to ensure alignment of contacts, and, apparently due to the shorter arcing time between the contacts under oil, practical tests have shown burning of contacts to be much reduced.

Air-break or Oil-immersed

For larger starters the main issue is between air-break and oil-immersed gear. It is objected, in regard to the latter, that oil is messy and is liable to catch fire if heated, and that when a circuit is broken some of the oil is broken up, generating a gas which, on reaching the surface could, if mixed with the right proportion of air, explode violently. On the other hand, easily replaced butt contacts can be used, and it is claimed that the head of oil in a well-designed starter pre-

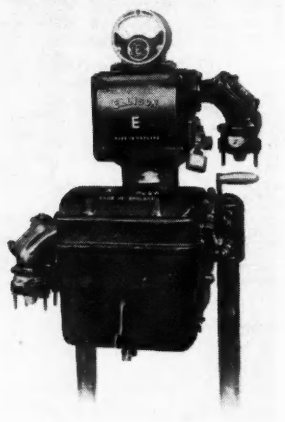


Left: Speed-torque curve for a slip-ring machine started against 200 per cent. full load torque. Various values of rotor resistance (r2) are given. Right: Speed current curve under similar conditions. and with resistances corresponding with those in the speed-torque diagram

vents the generation of gases at a sufficiently high temperature to explode; that burning of contacts is much less and, finally, that due to the speed of break (not necessarily speed of contact separation) much higher rupturing capacities are obtainable.

Air-break gear has a big advantage in that it is more compact and costs far less than the corresponding oil-break type. On the other hand, drum type contacts, frequently made of extruded metal, are liable to get out of alignment, causing bad contact and consequent burning, and their replacement entails the dismantling of the starter. The speed of break is so low that rupturing capacities are small, although this objection is removed in cam-contactor gear. Further, the difference in price permits of the use of high rupturing capacity fuses, thereby giving a much higher duty to the air-break switch than is possible with an oil-break switch at a reasonable price. This type of gear also obviates the difficulty of contact replacement. The disadvantages of oil are not serious, provided that advantages such as reduction in price, or high rupturing capacity or reduction in maintenance cost can be offered by its use.

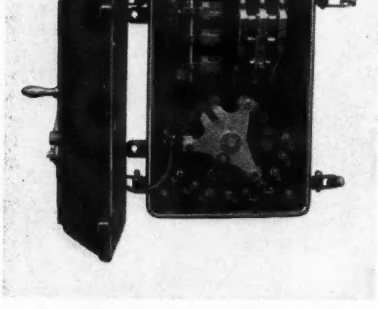
In the cam contactor principle movement of the cam causes the finger to pivot and closes the contacts. Motion can be effected by means of a trigger action under the force of a spring, the speed of the make and break being then independent of the cam travel. In practice, the arrangement is subject to various modifications, such as having one spring to control both movements of the contact piece. In one variety the main lever and operating lever are pivoted on knife-edge bearings of hardened steel held together by a robust operating spring.. The movement of the spring pulls the main lever over dead centre, the contacts thus closing and opening in a positive manner with a snap action.



40-A hand-operated, oil-immersed star-delta starter with isolator gear and ammeter; rupturing capacity 1,000 kVA (George Ellison, Ltd.)

Starters for Slip-ring Motors

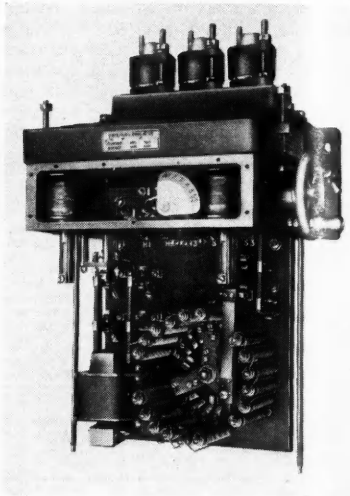
Before considering control gear for the slip-ring motor the grounds on which its use is justified should be decided. It has the following inherent disadvantages:—A wound rotor which is much less robust than the cage type; wearing parts in the brushgear which is itself a complicated piece of apparatus, especially if brush lifting and short-circuiting gear is fitted; higher cost; lower efficiency and power factor. The advantage is shown up by the speed-torque and speed-current curves as resistance can be introduced into the rotor circuit so that the point of maximum torque is removed from that approaching full speed to the starting position, thereby enabling a much higher torque with a lower current to be obtained, the usual value being 100 per cent. full-load torque and 125 per cent. full load current.



Combined air-break, air-cooled stator/rotor starter with contactor stator switch (E. N. Bray, Ltd.)

In the speed-torque curve for a slip-ring machine with various values of rotor resistance (r_2) the superimposed thick line represents the torque obtained when a faceplate switch is used to change from one resistance to another. In the speed-current curves the resistances shown correspond with these, the thick line representing the current taken from the line. A comparison of these curves with those given earlier for the squirrel-cage motor shows up clearly the immense advantage of the slip-ring machine.

Whether higher cost, worse performance and less robust construction are justified by the low starting current is a matter for discusion in each individual case. For a slip-ring motor there is only the stator-rotor starter in the following types: (1) Air-break stator contactor (or drum-type hand-operated stator switch) with air-cooled rotor resistance. (2) Oil-break hand-operated stator circuit-breaker with air-cooled rotor resistance in a separate case. (3) Oil-immersed stator contactor (or drum-type hand-operated stator switch) with oil-cooled resistances all enclosed in one case. (4) Oil immersed hand-operated stator circuit breaker with oil-cooled resistance in separate cases. (5) Oil-immersed hand-operated stator circuit breaker and liquid rotor starter.



Combined oil-break, oil-cooled stator/rotor starter with contactor stator switch (Allen West & Co.)

Air-break air-cooled gear is by far the cheaper up to about 25 h.p.; between 25 and 40 h.p. there is very little to choose between the prices (exclusive of oil) of this and the combined oil-break oil-cooled starters. Above 40 h.p. the oil-break oil-cooled gear is the cheaper, apparently because oil is a better heat conducting medium than air and a smaller resistance, which is a large part of the cost, can be used. The oil-immersed oil-cooled gear in separate tanks is more expensive than either of the above; while liquid rotor starters generally cost still more. The price of a circuit-breaker with separate air-cooled resistance lies between that of items (1) and (3) above.

As regards the stator portion, the same considerations as given for the direct-on and star-delta starters apply, and as long as the stator switch is of the contactor type of sound construction there is no objection to the air-break gear, unless high rupturing capacity is required.

As the rotor consists of a series of contacts over which the brush moves without ever breaking the circuit there is no advantage in switching to be gained by oil-immersed gear.

The operating mechanism of this type of breaker should be such as to ensure a pause at each stage. If time is not given for the motor to run up to the proper speed the change to the next value of resistance will not take place at the point of maximum torque and the current peaks will be greater, so that the one advantage of the slip-ring motor is lost.

Resistances are required to absorb a certain amount of energy during the starting period, *i.e.*, they must have a sufficient h.p.-minute rating. It is here that oil-break gear has an advantage in compactness due to the better heat conducting properties of oil. However sufficient capacity, in sizes up to 40 b.p.h. capable of starting an industrial motor against 100 per cent. full-load torque, is generally provided in the air-cooled type as other considerations dictate a size of case which enables the heat to be radiated. The casing of the air-break gear must be dustproof.

In higher capacities the choice lies between oil-immersed gear in one case or two cases. If a low rupturing capacity is required the combined unit will usually be chosen on price. If, however, high rupturing capacities are required, the separate unit arrangement will most probably be better as the cost of h.r.c. fuses would bring the price of the combined unit to that of the separate unit.

To summarise, the selection of a squirrel-cage or a slip-ring motor for a particular drive is determined by the limitation to the starting current, apart from which a squirrel-cage motor is to be preferred. The selection of the starter, looked at as a starting switch only, is governed by the speed-torque characteristic of the load, any limitation to the starting current, and, in the case of a stator-rotor starter, the time required to accelerate the driven mechanism under the influence of full-load torque. Users and those responsible for installations should either make definite decisions themselves or give all the above information to suppliers of the motors and starters to enable them to make a correct selection. A decision should not be arrived at on price only without consideration of performance.

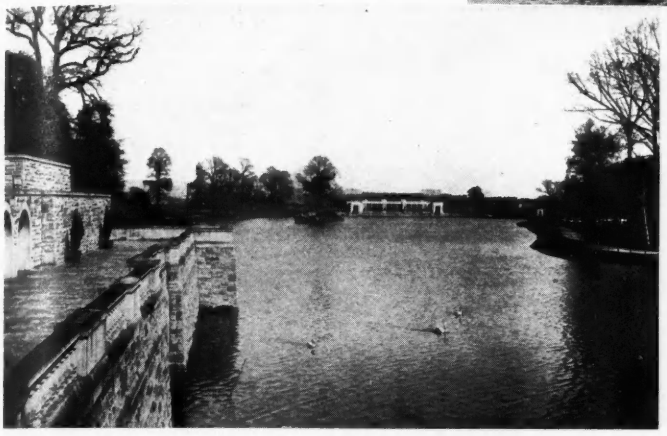
Science and Industry

Points from the B.A. meeting at Nottingham

In our last issue we dealt with the presidential address of Sir Edward Poulton which opened the proceedings of the British Association at Nottingham on September 1st. The address of Sir Alexander Gibb as president of the Engineering Section was also reviewed. Below we report a number of matters of more or less directly electrical interest which arose during the proceedings which ended on Wednesday last.

Applications of X-rays

ON September 2nd, the morning in Section A (Mathematical and Physical Sciences) was devoted to a symposium on X-ray methods and industry. The president of the Section, Dr. G. W. C. Kaye, opened the meeting by announcing that the greater part of the proceedings of the Section would be devoted to emphasising the beneficent influence of applied science on the national life in every aspect.



[*L.N.E.R.* photos.

Two views of University College, Nottingham, where the meetings of the various sections were held

Sir William Bragg said that when, twenty-five years ago von Laue showed that X-rays were a form of light he opened up more extensive fields of usefulness than did even the original discovery by Röntgen fifteen years before. The shortness of the waves gave them a fineness which enabled minute details of atomic structure (upon which the properties of solid bodies depended) to be examined.

In some cases X-rays were employed in industry because they gave, as nothing else could, a measure of the presence of some crystalline constituent or some degree of crystallinity without disturbance of the body examined, which might weigh even less than a milligramme. The full consequences of more fundamental researches into laws which related structure to properties would ultimately far exceed the more empirical applications.

X-ray methods had thrown light on phenomena such as hardening, annealing, slip, continuous creep and fatigue. The properties of certain alloys had been shown to depend on the geometrical arrangement of the sites occupied by the atoms rather than on the nature of the atoms themselves.

Dr. G. Shearer showed how the arrangement of the atoms in a metal altered when other constituents were added. By X-ray examination it had been ascertained, for instance, how the addition of tellurium to lead assisted water pipes to resist the action of frost, and an instance was cited in which X-ray methods had proved bad annealing to be the cause of trouble.

Messrs. J. T. Randall and H. P. Rooksby (G.E.C. Research Laboratories) discussed the use of fluorescent materials in colour modification and improvement of luminous efficiency in discharge lamps, and in cathode-ray tubes for television receiving sets. The colour of fluorescence depended on the substance chosen and on the impurities incorporated in it. It could be varied by changes in the crystal structure as well as in the activating impurity. By altering the ratio of zinc oxide and silica in willemite a second zinc silicate with different crystal structure had been prepared which when excited gave a yellow instance of green fluorescence.

Messrs. R. W. Powell and W. A. Wood described how certain micas of the phlogopite type showed a sudden decrease in thermal conductivity at about 200 deg. C. An X-ray examination during a temperature cycle of 16 deg. C. to 400 deg. C. revealed that heat treatment might bring about a very marked mosaic formation without apparent change in external appearance. The structure might revert partially to the original state on cooling, and a close parallel existed between this effect and the abnormal fall in thermal conductivity. The authors suggested that this combination of thermal and X-ray work provided a specific illustration of a fruitful application of X-rays to the study of a material of industrial importance.

Dr. A. J. Bradley said that the properties of powerful permanent magnets made of alloys with a composition near to that of Fe_2 NiAl could be explained by X-rays. Powder photographs of the slowly cooled alloys had given a new phase diagram. The main single-phase areas were face-centred cubic (α) and body-centred cubic (β). It was formerly thought that the intermediate area was simply an ($\alpha+\beta$) region, but this was only correct at high temperatures. On cooling, the receding boundary left a new two-phase area consisting entirely of body-centred crystals with different compositions. This was possible because the β boundary on the nickel-rich side was curved like a bow. The two-phase ($\beta+\beta_2$) area, between the bow and the bowstring, included the composition of Fe_2NiAl. On slow cooling this alloy split up into Fe_{88} NiAl (β) and $Fe_8Ni_7Al_7$ (β_2) with lattice dimensions differing by 0.3 per cent. To develop maximum coercivity, the alloy was cooled at such a rate that there was not time to form two distinct types of crystal, but there was a continuous variation of composition. Tiny "islands" of iron-rich material were forced to conform to the dimensions of the parent lattice. The resulting strain produced a powerful coercive force.

It was agreed at the conclusion of the discussion that the Council of the Association should be asked to find a common platform whereby industry might be kept more closely in touch with developments in X-ray technique.

Graduates for the Engineering Industry

ON September 3rd, Section G—Engineering, devoted a session to the discussion of the training of university graduates for engineering. Professor F. G. Baily said that the education of engineers fell under two heads—a normal college day course with practical training, and an apprenticeship course, partly day or wholly evening. The college course for the first year for all students would be devoted to the basic sciences. In the second year the sciences would be suited to each division of engineering. Courses in general technology and in allied subjects would be given in each division. In the third year two or three sciences would be continued, with one or two technical courses in allied subjects, but at least half the time would be devoted to the main subject.

Theories of commerce or industry would preferably follow practical experience. A fourth-year course, if given, might be akin to post-graduate work and consist more of direct reading than of lectures, with advanced laboratory work, more particularly for those going in for research. It might be followed by a year in the college laboratory before going on to practical training. The three-year course should be self-contained; but the degree awarded at the end should be only an ordinary degree, perhaps with a distinction of class. The fourth year's work would qualify for an honours degree.

The balance of advantage was much on the side of the college preceding the works, although lads often obtained a better understanding of the theory if their interest had been aroused by knowledge of its practical application. In the "sandwich"

system, six months of pupilage in the latter half of the second year gave the student a greater interest in the technical parts of the third-year course, whilst the break was not too long. Arranging for machine work had become more important than manual work.

Prof. Baily outlined the apprenticeship schemes now in force. A suggested scheme was that for the first two years the boy should attend continuation classes, and should spend the summers of his third and fourth years at a technical school. In the winter of those years and of the last year also some evening classes should be taken.

The President of the Section (Sir Alexander Gibb), said he was a member of the governing body of a college at which the students' fees amounted to exactly 50 per cent. of the costs to the college.

Industry and the Universities

Dr. A. P. M. Fleming (Metropolitan-Vickers Co.) and Dr. W. Jackson, in a long paper on the subject, submitted that a more effective co-ordination of industrial and university resources was needed. The electrical engineering concern with which the authors were associated absorbed about 100 university graduates per year. It was of vital importance that the larger industrial organisations should accept this responsibility.

In addition to engineering training, attention was now given to industrial administration. Universities had tended to afford opportunities for concentration on particular aspects of engineering development, and consequently the curricula became either overloaded or unduly specialised to the detriment of their educational value. On the other hand, industry had been too prone to consider that its function was limited to providing practical experience in the works.

The most satisfactory arrangement would be for specialised technical instruction to be given within the works during works hours, when direct access could be had to a wide range of expert opinion to deal with different aspects of the various subjects. The university could then concentrate on teaching the properties of engineering materials, and the scientific principles involved in their application.

Greater opportunity should also be provided for the study of subjects of a non-technical character since the engineer also had a responsibility in exercising a directing influence in ordering the distribution and sensible utilisation of the increase of goods he brought about.

The two-year course of college apprenticeship in operation in the authors' concern seemed to provide a suitable foundation for such a scheme. In general, only students entered this scheme who had completed a university course. A youth who had satisfied the university entrance requirements could, however, spend a preliminary year in the works. On graduation he returned to the works for a further year.

The student thus formed some conception of what an industrial engineering career involved early enough for him to change his intended line of university study. The disadvantage of producing a break in the continuity of study had been partly offset by allowing probationary apprentices leave to attend specially arranged classes in science and mathematics on one day per week. All college apprentices devoted the major part of the first year to purely workshop training, but after this the sequence of departments was arranged to suit the branch selected.

After Apprenticeship

On completing the course, most apprentices joined the junior staff but they were under no obligation to remain with the company. Each year a few members of the junior staff were selected for a further one or two years of training with a view to filling senior vacancies and afforded opportunities for obtaining administrative experience. Lectures on workshop practice were given on one evening per week throughout the winter of the first year of apprenticeship. This course was to be supplemented by one, given during works hours, dealing with works organisation and administration.

During the coming winter two lecture courses for second-year apprentices intending to take up research and development work would be given during works hours and supplemented in the students' own time by tutorial work. The subjects proposed were the limitations imposed on the design of mechanical and electrical plant and apparatus by the properties of the materials of construction (including magnetic and insulating materials) at present available and vibration in mechanical and electrical systems. These students would also be expected to study a foreign language, preferably German.

The graduate who intended to follow an industrial career was probably best advised to enter immediately upon the course of apprenticeship training. If he desired it he would join the Research Department at about the middle of his second year, complete his apprenticeship there and then be absorbed into the junior staff. In due course he would become identified with some particular branch of research. At this stage men of outstanding ability should be allowed to return for one or two years to an appropriate university, either at home or abroad.

The universities should undertake research on borderline subjects which an industrial research laboratory often could not tackle, and industry should assist, both by the loan of equipment and by financial assistance, in development. In addition, industry should afford facilities in its research laboratories for the universities to carry out work beyond the scope of their own financial resources.

Post Office Methods

Sir George Lee (Engineer-in-Chief, G.P.O.), in a written communication, stated that the proportion of heavy to light engineering in the G.P.O. was small. For the former they recruited graduates who had already had some practical experience. For lighter engineering graduates were recruited by an interview conducted under the auspices of the Civil Service Commissioners, stress being laid on personality, judgment and character. All classes of recruits were instructed at a school at Dollis Hill in the technique and organisation of the work of the department. Universities could not follow the rapidly developing telecommunication sciences, and Sir George preferred that graduates should have been instructed in underlying theory, leaving the instruction in technique to the department.

All the young men, even those ultimately intended for research work, were posted to various duties and were moved about to widen their experience. After two years they settled down to some branch for which they showed aptitude, prior to which they were regarded as probationary only.

The improvement most desired in the product of the universities was in the direction of a wider cultural education with two foreign languages, preferably French and German.

Professor Sir Thomas Hudson-Beare said that he had always insisted that the drawing office and laboratory were two of the most essential features in the training of a young engineer, because the teacher came into very close contact with the student at the bench. In his university contact was maintained between students of different departments, which widened their outlook greatly. He disapproved of specialising at a university. The students must be educated in sound general principles on which all engineering was based.

Mr. H. A. Ward (Rolls Royce, Ltd.) said that fifteen university men had entered the works last year for free practical training over three years. They were paid a salary which enabled them to live independently of their parents. The company was also encouraging engineering apprentices to enter the works from secondary and public schools for four or five years. They were encouraged to work at the Technical College, Derby, on a day course and on two evenings per week and were expected to attain at least the higher national certificate and ultimately qualify for administrative positions.

The Place of the Technical School

Mr. N. F. Sheppard, representing Section L (Educational Science), urged that the universities should teach those matters, the economic value of which might not materialise until later. The training of the ordinary engineer was the work of the technical schools and not so much of the universities, to which only the most brilliant from the technical schools should go. The technical school must come between the university and the industry, and must be supported largely by the industry.

Prof. C. H. Bulleid (University College, Nottingham) emphasised the value of college training immediately after leaving school. It was difficult for a boy who had been in the works to come back and pick up physics, but later, being more mature than the ordinary apprentice, he could get into practical work more quickly. A university student must specialise to a certain extent in his third year.

Professor E. W. Marchant (Liverpool) emphasised the advantage to engineering and to engineering students of training in a university, where they had cultural association with students training for other professions.

Dr. L. G. A. Sims urged that class-room teaching of the student ought to be the business of the professional teacher throughout. The college teaching staffs should be allowed to draw from industry items of new information. He advocated planned "sandwich" systems in which the practical work dovetailed logically with the college courses.

Professor R. V. Southwell (Oxford) required students to give him their mornings on six days a week during the term; in the afternoons they did tutorial work and were required to read.

Mr. Naylor suggested that as civil engineering more than any other meant the supervision of manual labour, the student should be taught in his first year to use a pick and shovel and a sledge hammer and to mix concrete. It would provide an opportunity to come into contact with workmen.

Trawler Bunkering at Fleetwood

Six new high-capacity coaling plants

As part of a scheme of modernisation and electrification of the machinery at its docks at Fleetwood (Lancs), the L.M.S. Railway has installed six similar electrically operated coaling plants, each having a capacity of 200 tons per hour, for dealing with fishing vessels. These have been supplied to the specification of Mr. W. A. Stanier, the company's chief mechanical engineer, by Mitchell Engineering, Ltd. Three of these plants serve the Wyre Dock and three the Fish Dock.

Formerly the coaling of trawlers was carried out either by means of steam cranes and buckets, hand loaded from railway wagons, or by three electrically driven transporter-type cranes, operating buckets also filled by hand, direct from railway wagons.

Each of the new plants has immediate accommodation for thirty full and thirty empty wagons, and is served by an independent full-wagon siding and an empty-wagon siding, graded up to the discharge point over a distance of 60 yards at an average inclination of 1 in 90. The full-wagon road is served by a vertical bollard haulage capstan having the haulage rope permanently attached to the bollard and provided with a return tail rope operating over a weight-applied tension gear.

The capstan is controlled from a cabin adjacent to the wagon tippler, and is also provided with an automatic, treadle-operated cut-out switch so fixed at the top of the incline that a wagon in moving on to the trip switch will automatically stop the capstan. From this point the leading wagon is moved on to the platform of a tippler by a 1-ton capstan. After discharge the wagon is automatically switched, by means of a spring-operated track switch, to the empty siding.

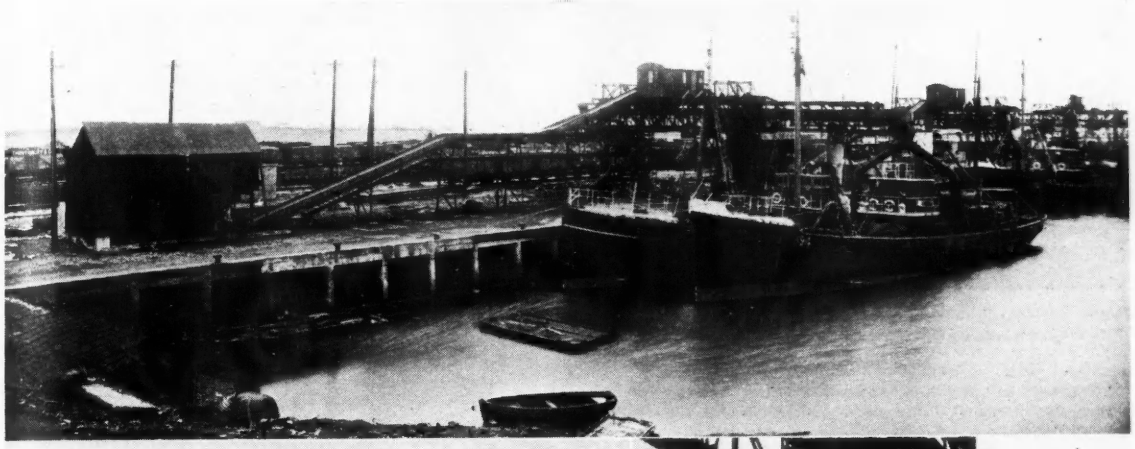
The coal-handling plant includes a wagon-tippler (side-discharge) feeding an inclined belt conveyor, which in turn delivers to a telescopic boom conveyor (mounted in a travelling bridge structure) provided with a luffing motion and flexible bifurcated chutes for delivering coal to the trawler bunker hatches. The main inclined conveyor is arranged at right angles to the boom conveyor. The tippler can handle wagons of from 8 to 20 tons, tipping a full wagon and lowering an empty one in two minutes. The whole of the tippler structure is of welded construction.

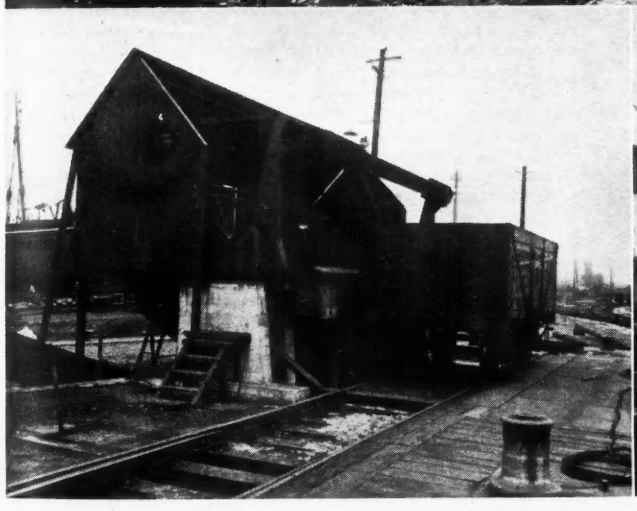
The coal is received from the tippler by a "W"-form hopper having an outlet on the inside face of each leg. Coal is extracted from the hopper by a double-acting jigger feeder each side, delivering inwards to a single outlet in the centre, ensuring a continuous feed to the main belt. The length of the stroke is adjusted to pass 200 tons of coal per hour, varying from "run of mine" to "duff," the bulk being a mixture of both large and small coal.

As the plant and chutes have been designed to pass coal below 12-in. cube, oversize lumps retained on the grid are broken by hand on the latter. A high-pressure water spray on the hopper lays the dust during tipping and at intermediate transfer chutes.

A 30-in. 300-r.p.m. inclined belt conveyor carrying 200 tons per hour delivers to the boom conveyor over a large travelling tripper attached at its upper end to the bridge structure and moving with it, the lower end being supported on flanged wheels running on a track fixed to the horizontal portion of the main conveyor steelwork. The travelling bridge is carried on four two-wheel articulated bogies running on rails at quay level. Its total travel is 40 ft. at 40 ft. per min., one bogie on each leg being driven through shafts and gearing from a motor on the top of the bridge.

The bridge structure supports in turn the telescopic boom, which has a motion of 50 ft. at right angles to the quay. The travel of the bridge and cross-movement of the boom are sufficient to cover the bunker hatches of two trawlers lying abreast. The telescopic boom carries throughout its length the boom conveyor, the outer end of which has a luffing motion giving a total rise and fall of 14 ft., to suit all levels of water inside the dock. The luffing and telescoping motions are both oper-





The New Coaling Plant at Fleetwood

1. General view of the equipment. 2. Wagon on the tippler of No. 4 coaling plant. 3. Near view of chutes on trawler

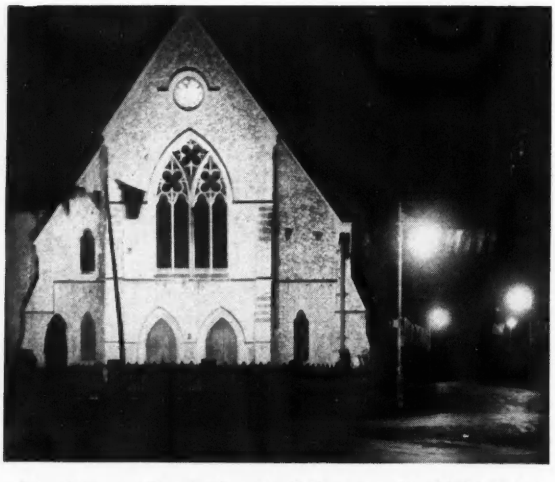
Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

Engineering Status

As an employer of some hundreds of skilled workpeople, I am interested in the matter of engineering status. Whilst agreeing wholeheartedly with both your editorial note and the comments of Mr. Charleton in your issue of August 27th, especially concerning social conditions and reactions, the matter as hitherto appears to hang on the meaning of "properly qualified."

After being actively engaged for nearly forty years in various branches of the industry, I have been driven to the conclusion that it is a vast mistake to follow the present trend of attaching too much importance to high theoretical attainments, except in special circumstances. To be more exact, the theoretical



The Congregational Church, Folkestone, floodlighted by Ediswan equipment during the A.P.L.E. Conference

standard asked of engineers to-day demands so much of the early time that when this has been acquired the individual has irretrievably lost the opportunity of acquiring the practical knowledge to apply it. Professors and lecturers may need this but what an engineer wants in serving the public is practical knowledge and experience, with sufficient understanding to back it up. The expression "art of directing the great sources of power in nature for the use and convenience of man" might be used more sparingly as most of us dream of this at college, but end up in far less important jobs.

It is plain that what is required is a qualification which the public will recognise as indicating the requisite amount of knowledge, but knowledge has been said to be skill from practice, as opposed to learning which is information acquired from others. The public knows this, if only subconsciously, and it is always useless to try and fool the public. The institutions had, and perhaps have, a good opportunity of supplying the want, but not in my opinion as they are conducted at present. In the past the corporate membership consisted of the solid experienced individual who could put up a good show anywhere, an important factor which was bound to be recognised in time, but now the object appears to be to aim at a corporate membership approaching the degree standard which is not only stepping into a field where they were neither required nor desired, but which brings with it all the evils mentioned earlier. In fact the institutions do not seem to entertain the engineer of the "useful to the public" type at all, as the following will indicate.

An engineer approaching fifty with a really comprehensive and useful experience, who had brought out patents, written informative technical articles for the leading journals, including your own, who is now in charge of a large works at a high salary, applied to the "Electricals" for admission as a corporate member, supplying all the necessary evidence. Their reply was that they could not offer him membership nor even, in fact, accept him as an associate, as in their opinion he did not comply with the stipulation "responsible experience as an electrical engineer for at least five years." Evidently they don't even wish engineers of long practical experience and good position to come amongst them, a truly remarkable state of affairs.

Surely this is not fair treatment or the way to obtain the requisite public recognition of the designations, and it may not be out of place to mention that Royal Charters are not granted for the sole benefit of our institutions, but mainly for the benefit of the public whom they are expected to serve. There are many more points one could touch upon but enough has been said to indicate how it strikes at least one employer.

September 3rd. THRICE CHARTERED.

Trawler Bunkering at Fleetwood (*Continued from previous page*)

ated by, and compounded in, a single two-motor differential winch on top of the bridge structure, so that either motion may be effected independently.

Coal delivered by the boom conveyor is distributed to the trawler bunker hatches by rotating double-wing chutes, the centre section of which is carried on ball-bearing rollers and incorporates a valve for diverting the stream of coal down either leg of the chute, but cannot be left in the central position.

The connection between the outer end of the bifurcated chute and the hatch openings is completed by flexible connecting chutes.

An All-electric Organ

In his article on this subject in your issue of August 13th, Mr. McKechnie Jarvis states that "the steel tone wheels are carried on a steel shaft sectionalised for stability and to minimise flux leakage." Also, he states, "to neutralise the effect of stray fields," the tone wheels "are grouped according to frequencies and their multiples." Would it not rather be correct to say that the steel shaft is sectionalised (each section revolving at a different speed) to produce the correct frequencies for the various notes, which incidentally, gives stability and minimises flux leakage and distortion of tone due to stray fields?

I have never seen an all-electric organ, but I venture to suggest that each section of shaft has a speed ratio of 17 to 18, not from any consideration of stability, etc., but simply because the ratio of frequencies of one musical note to its neighbour is approximately 17 to 18. Since the rate of vibrations of any one note has to be doubled or halved to produce its octave, it will naturally follow that the tone wheels will be grouped according to frequencies and their multiples, not for the reason stated in the article, *i.e.*, to neutralise the effect of stray fields, but because one is compelled for simplicity's sake, to put all the tone wheels related to the same note on the same shaft. For example, the "A" shaft is made to rotate at a fixed speed, say, 55 rev. per sec.: if a wheel is attached to this shaft with eight high spots to give a frequency of 440 per sec. the resultant sound will be the standard "A" pitch. If two other wheels, one with four and the other with sixteen high spots, are attached to the same shaft, they will produce the "A" an octave below and above respectively, and so on.

I make these observations with all due diffidence to correct what is, to my mind, an incorrect view of the primary considerations in the layout of an all-electric organ, and to suggest that the expert is apt to emphasise incidentals in so far as they relate to his own particular sphere, and to lose sight of the obvious. K. H. DAVOLLS.

Enfield, *September 4th.*

Cooking Utensils

Mr. Trinder's further letter of August 27th is not only more contradictory, but fails so completely to establish any real facts built upon ascertained and reliable tests, that it is obvious his so-called "tip" to users of electric cookers is merely based upon expediency, and as such it is unsound and may do a great deal of harm. In his first letter he frankly admits that "we in the electrical retail trade know that the heavy flat-bottomed utensil is essential." If it is essential, why attempt to suggest that it is inferior?

His real and only complaint is that the expense of these specially constructed utensils may interfere with the sale of cookers. We admit the expense, but he then goes on, in both his letters, to make assertions regarding his tip which should not be allowed to pass because, on his own showing, he has not carried out any comparative test at all. How can Mr. Trinder expect me to agree that he has made a fair test when all he has done is to use a set of four iron saucepans for over five years, and has never used correctly constructed aluminium utensils?

To say he obtains excellent results can mean anything—

excellent is a comparative term—but he cannot possibly argue that the results are better or as good as something he has never tried. He says he has four points in mind, *viz.*, initial cost, time of heating, wear and tear, and duration of service. We already agree as to the difference in the first cost, but what can he possibly know about wear and tear, and duration of service, when he admits not having any of these specially constructed utensils? The specially-constructed aluminium utensils will last a lifetime—they won't break, and each utensil carries a guarantee against distortion. Moreover, aluminium is a most excellent conductor of heat, making it particularly suitable for hotplate cooking.

With regard to the time of heating: we say, after having made the most elaborate and prolonged tests, that quicker boiling will be obtained by using correctly-made aluminium utensils than those made from any other metal. This, however, is by no means the whole test which is required, as a thin flat bottomed aluminium or copper utensil would give even slightly better results to commence with, until it became distorted in a few weeks and made contact only at the spot where the saucepan had bulged. It is because so many electricity supply engineers have found this to be true that they have insisted on correctly constructed utensils being supplied as part of the necessary equipment of an electric cooker.

Mr. Trinder then goes on to suggest that old saucepans were made to comply with the law of expansion and contraction of metals. If his assertion were true the problem would not have arisen with the advent of the enclosed hotplate. It did not matter if the bottom of a stewpan bulged or became hollow because there was a flame to lap all round it. When the demand arose for specially constructed utensils which would be flat to commence with and stay flat, it was found that *all* utensils, thick and thin, made in any metal and irrespective of price, distorted either by bulging or becoming hollow.

Further investigation demonstrated the reason for a vessel gradually becoming bulged or hollow on being heated and cooled over a period, and still further investigation revealed how to maintain flatness when the temperature of the vessel did not rise much beyond boiling point. With this correct knowledge now available, it is surely the worst possible salesmanship for anyone to tell householders that they can use the same old iron saucepans as in the past.

The question is not which is the best metal, or the cheapest, because every vessel of any metal, even if flat to commence with, will lead to both waste of time and money and certainly cause disappointment, unless it has been made to withstand the inevitable distortion which must take place. This is why it is essential to look further ahead in salesmanship than the mere sale or installation of an electric cooker.

With reference to Mr. Robert C. Pierce's letter in your issue of September 3rd, I maintain that there are no superior boiling powers in cast iron saucepans at all. Further, the last part of his letter does not apply to the question of heating on the enclosed electric hotplate, as this is not radiant heat, but heat by contact.

HAGUE & MCKENZIE, LTD.,
T. N. VEITCH,
Director.

Birmingham, *September 3rd.*

Carrier Telephony

In reply to the criticisms of Mr. P. L. Westell in your issue of July 30th on my article, may I say, in the first place, that the band width recommended by the C.C.I.F. is 0.3 to 2.4 kc. and that employed in my system is 0.2 to 2.0 kc. The percentage articulation will be about 85 and 75 respectively which are not much different. Unfortunately it was not possible to make the band width the same as that recommended by the C.C.I.F. without extending the frequency range beyond 8.2 kc., whereas previous measurements had shown that attenuation for frequencies above that limit increased more rapidly for both types of circuit. Also cross-talk before and after balancing will not be greater than the permissible levels for voice-frequency two-wire physical channels by keeping within 8.2 kc. V.f. channels when not in use for telephony are no doubt narrower for eighteen-channel v.f. carrier telegraphy (0.42-2.46 kc.), but could certainly be used for a twelve-channel telegraph system (0.42-1.74 kc.).

Mr. Westell gives the theoretical minimum of carrier power to be supplied to the ideal modulator at +14 db. on wanted sideband on the basis that the carrier has to be attenuated 8 db. more than the wanted side-band, and the carrier power at the demodulator should be +6 db. on the latter to provide against "over-modulation." In this case, a valve-modulator system with little loss and ample stability has been used. The carrier power supplied was about +10 db. on the wanted side-band, since the carrier power was about the same as that of wanted side-band at the demodulator. "Over-modulation" was no doubt present, but it was pre-determined by oscillograms that wave-form distortion of the envelope at the demodulator was practically inappreciable up to the above limiting power ratio.

The need for a pilot (for amplitude control) is great in most countries. In some tropical and semi-tropical countries, the variation of temperature during 24 hours at 2 to 3 ft. below ground is sufficiently large (both in summer and winter) to justify the use of some form of pilot. In Great Britain, this variation is inappreciable, but I know that pilot-wire or channel systems have been used in the United States. The use of transmitted carrier for this purpose reduces the cost of equipment. The demodulator works more or less at about the same point, as the carrier to side-band power ratio can be maintained almost constant. This is more so in cable circuits where attenuation change is not so rapid as in open-wire circuits.

I fear Mr. Westell has not been able to see my point regarding phase-distortion. In a carrier-suppressed system, suppose $B\sin[(w+p)t]$, one of the upper side-band frequency components, undergoes phase-shift in transmission and becomes $B\sin[(w+p)t+\phi_1]$ at demodulator. By supplying a carrier $A\sin wt$ at the demodulator and filtering out the audio-term, we get $kAB\cos(pt+\phi_1)$. Similarly, other components will give $kAB\cos(qt+\phi_2)$, $kAB\cos(rt+\phi_3)$. This will certainly give phase-distortion in the present case where ten additional line-filter sets have to be used in each repeater section.

If both carrier and side-band are transmitted, then at the demodulator carrier will be $a\sin(wt+\phi)$ and side-band $B\sin[(w+p)t+\phi_1]$. The audio-terms will be $kaB\cos(pt+\phi_1-\phi)$, $kaB\cos(qt+\phi_2-\phi)$. Since ϕ is roughly equal to ϕ_1, ϕ_2, ..., their difference will be negligible and no phase distortion will take place.

S. P. CHAKRAVARTI.

Calcutta, *August 30th.*

Standardised Cartridge Fuses

With the increasing use of cartridge fuses in so many smaller pieces of modern apparatus, would it not be an advantage to regulate the manufacture of so many types before utter confusion reigns in contractors' offices? These fuses are of all sizes, and it is exceedingly difficult to obtain replacements in a very short time. Consequently (as I have seen) pieces of fuse wire are wound round the clips so as to make the apparatus workable.

It seems to me that if, say, all cartridge fuses were made with the same dimensions for the same ratings, we should have little difficulty in obtaining replacements for any type and make of apparatus. This should not be a very difficult matter.

Portsmouth. ERIC S. WEEKS.

Colour in Window Displays. By D. Mills

A GLOOMY or badly lighted window ceases to have an attraction value after dark. No matter how good the display is during the daytime, the sales appeal is lost if it cannot be seen at night. In addition to being an attraction, a well-lighted window should ensure a good distribution of light, reduce glare, eliminate shadows and furnish an efficient intensity of illumination.

Nothing gives a window so much individuality and interest as colour lighting. Colour creates a definite effect by emphasising the spirit, colour or season of the display. White or clear light is judged to be the most effective for artificial lighting because of its intensity or brightness. Amber light is calculated to give the idea of sunlight, warmth and cheerfulness, and a combination of red and amber will produce a rose tint that is often very effective and most attractive to the eye. Blue is a cold colour and should be used to produce the effects of night, winter, etc., but it will be found excellent for displaying chrome-ware and enamelled goods. Green is a colour that will appropriately produce a "springtime" atmosphere or give an effect suggesting coolness and quiet.

The following table shows how some coloured crêpes are changed or affected by colour lighting:—

Colour of light.	Colour of crepe.	Combination colour of crepe and light.
Red	Yellow	Orange
Red	Blue	Violet
Red	Dark Blue	Purple
Amber	Dark Blue	Grey
Amber	Violet	Maroon
Green	Red	Brown
Green	Orange	Yellow
Blue	Orange	Brown
Blue	Yellow	Green

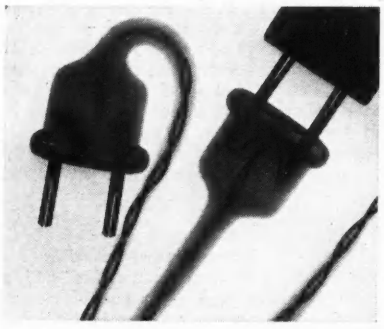
Colour lighting is quite easy to accomplish for all that is required are some sheets of fairly thick cellophane of the "non-flam" quality, fitted into frames that will clip on to existing lights or spotlights, and properly used colour lighting can be a valuable ally in increasing the volume of sales.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Safety Cables and Couplings

To overcome trouble due to bad connections to plugs and sockets, &c., "Flexo" safety flexibles and couplings have been introduced by the INTEX ENGINEERING CO., LTD., 15, Dartmouth Street, London, S.W.1.



An X-ray view of the waterproof plug and socket

The "Flexo" coupling is moulded into one unit. In addition, the cores are looped inside the mould before being soldered to the pins, and however much the flex is pulled the connection cannot be broken.

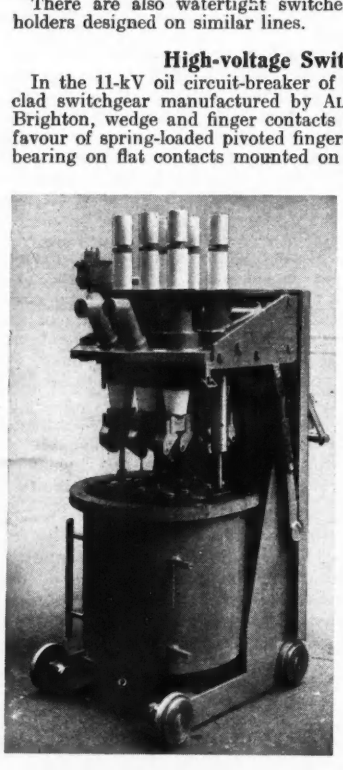
The covering of both plug and socket is made of rubber and the coupling is hermetically sealed and made watertight by means of a lip on the outside cup and the flange on the plug. The company informs us that one of these connections was tested by subjecting it to a voltage of 2,000 following immersion in water for three days.

It is possible for any type of connection, however intricate, to be constructed by this method, and there is the additional advantage that such connections may be roughly treated without being damaged. Also, where a lead is applied to delicate instruments, such as electro-medical apparatus, the soft rubber is not likely to damage fragile trays, instrument dials, or any other part of the machines on which it may be dropped, while the whole lead can be immersed for sterilising.

There are also watertight switches and waterproof lampholders designed on similar lines.

High-voltage Switchgear

In the 11-kV oil circuit-breaker of the "O.B." type metal-clad switchgear manufactured by ALLEN WEST & CO., LTD., Brighton, wedge and finger contacts have been abandoned in favour of spring-loaded pivoted fingers with spherical surfaces bearing on flat contacts mounted on the moving bar.



The 11-kV Allen-West oil circuit-breaker

Low contact resistance is secured by spring pressure, which eliminates oil films, and by the use of special silver alloy. Pressure is augmented by electro-dynamic forces due to the passage of current, which is broken on the arcing contacts only. Rupturing capacity ratings are in accordance with the 1937 B.S.S.

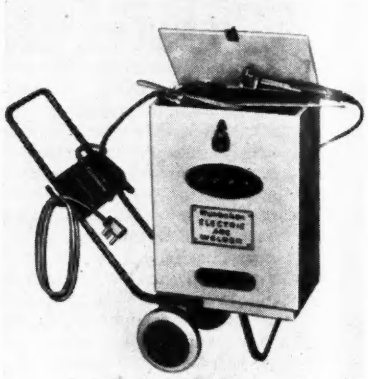
Duplicate bus-bars in separate chambers, one behind the other, are supplied. Bus-bar selection is normally "off-load" by lowering the breaker from one set of bars and raising it to plug in to the other, but selector switches can be provided. Insulators have self-aligning butt contacts of silver alloy which engage, with a rotary motion, with flat silver stationary contacts. Moving contacts are housed in a withdrawable metal cylinder to avoid corona effects. Automatic shutters are fitted to the isolated orifices.

The circular tank is of silver-plate steel with dished bottom steel phase separators and insulating lining. Pebble vents release gases above the oil. For working currents of 600 A and over the webbed steel top plate has non-magnetic inserts.

Toggle operation, either manual or remote control by a d.c. solenoid, is provided. In the former case, hesitation on the part of the operator causes the breaker to return freely to the open position. The tripping system requires only 2 VA at 5 A; over-current and under voltage releases, and shunt and earth leakage trips can be fitted with c.t.'s where requisite. Voltage transformers with fuses are contained in a compartment at the top of the unit and are removable without interrupting the supply. Cables can be jointed from the front by removing the circuit-breaker, so that the clearance from the back wall can be minimised. The whole structure of the switchgear is of fabricated steel.

An Electric Arc Welder

A new welder has been introduced by RUNBAKEN PRODUCTS, 280, Deansgate, Manchester. It is in a steel housing and is fitted with a tapped static transformer, regulation being automatic. The output is 5 kVA and the following tappings are provided: 20 V at 180 A for light work, 36 V at 120 A for medium work and 60 V at 100 A for heavy work.



The Runbaken welder

Iron-clad switchgear with two fuses is incorporated, and a pilot lamp indicates when the welder is ready for operation. There is a patent holder for the welding equipment and a heat resisting handle, with quick-release action, which takes either carbons or welding rods.

The trolley is of cast-iron and fitted with two 6-in. rubber covered wheels, and the finish is black "crackle," the metal fittings being chromium plated and the trolley coloured red.

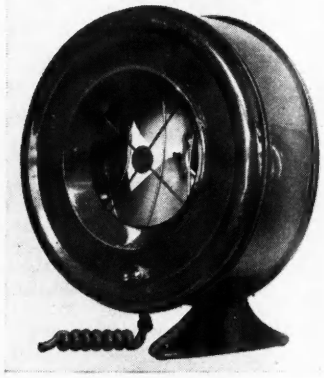
The simplicity of design enables the welder to be used by unskilled labour. There is also a "Junior" model.

Improved Boiler Thermostat

THE RHEOSTATIC CO., LTD., Slough, informs us that the adjusting knob of its new boiler thermostats has been designed with two scales, one fitted to the face and the other on the edge. By this means the setting can be easily read and adjusted in whatever position the thermostat is installed. An additional feature is that a cast aluminium cover and base has replaced the old pressed metal cover.

A Heating Attachment for Fans

An interesting novelty by W. T. DRIVER, 10, Store Street, London, W.C.1, is a heating attachment for fixing to ordinary electric fans.



The Driver heating attachment fitted to an 8-in. "Handybreeze" fan

The front of the device is detachable and houses a 1-kW heating element which is fixed round the outer edge, being hidden by the casing. Air from the centre of the fan is deflected to the sides by a shield (not shown in the illustration). At the back there is the ordinary fan guard, and a mesh finger guard at the top in case the fan should be picked up when in use. The rear part of the casing is fixed on to the fan guards by means of three clips.

New cable is supplied, as this is necessary to carry the load for the heater. Two leads go to the motor and two to the heater *via* a small switch in the casing.

The price is low, and various sizes are made while a complete fan and heater can also be obtained. Apart from room warming the fan is admirably suited for drying clothes and photographic negatives, and preventing shop windows from becoming steamy.

The Grid in Central England. By H. M. Sayers

The case of the West Midlands J.E.A.

THE substance of the complaints of the West Midlands J.E.A. against the effects of the 1926 Act was set out in the ELECTRICAL REVIEW of September 3rd (p. 319). Briefly the Authority claims that the control of the Central Electricity Board over the working of its stations has been such that those stations have been worked in a less economical manner than if they had been under the control of the J.E.A. for supply to its own consumers; in particular that it has obliged the J.E.A. to "import" energy from the grid so that the anticipated benefits of the grid have not materialised. Added to these effects is the cost of C.E.B. administration which is added to the cost of generation and reckoned as part of the price of the energy repurchased from the C.E.B. The total of these additions to what would have been the cost if the J.E.A. had been independent of the C.E.B. would have been very considerable but for the provisions of Section 13 of the 1926 Act to which reference is made later.

It should be remembered that these estimates are *ex parte*, that the C.E.B. may have arrived at other values, and that adjustment between the parties is still in progress. The only period for which a settlement has been arrived at is the first nine months of the C.E.B. trading, ended December 31st, 1934. The delay in settlement is embarrassing.

As matters between the parties in respect to later periods are still *sub judice* it would be out of place here to attempt any discussion of the amount involved. More useful may be some general reflections upon the circumstances which have led to the complaint.

The Origin of the Scheme

The J.E.A. was established in 1925 to carry out in a complete form the kind of scheme adumbrated in the Electricity (Supply) Act, 1919; taking over the existing generating stations and constructing a modern large station and transmission lines to serve the whole district. It is an example of what can be done (or could have been done) under the 1919 Act to improve conditions in delimited districts. It has been very successful: the output in the district has been greatly increased and the costs to the authorised undertakers progressively decreased, with corresponding benefits to the ultimate consumers.

The Act establishing the Central Board was passed in 1926; the Central England Scheme under that Act was published in 1928. It covered the West Midlands District and "selected" the stations of the J.E.A. to be operated under the control of the C.E.B. The preliminary estimates published with the Scheme showed that the J.E.A. would benefit from the beginning of trading by the C.E.B. The trading period commenced early in 1934, the results compared with those which would have been realised if the J.E.A. had been left to itself have certainly not been beneficial. One may remark that the interval between the making of the Scheme estimates and the commencement of trading—six years—may account for some of the difference.

The C.E.B. control has for its object the working of all "selected" stations in such a co-ordinated way as to incur the lowest production costs for the whole area. It may happen that a particular station, or group of stations, could have been worked more economically if controlled to supply only the requirements of their owners. There may be a difference of opinion between the owners and the C.E.B. on this matter.

The owners of selected stations are protected by Section 13 of the 1926 Act which says that the C.E.B. may not charge them more for each year's supply than the cost at which they could have supplied themselves. In case of difference, that cost is to be proved to the satisfaction of the Electricity Commissioners, and established as "the opinion of the Electricity Commissioners." The process of proof for the formation of that opinion is not clearly defined in Section 13; but it puts upon the owners the onus of preparing a statement of "the cost which they would have incurred had this Act not been passed in themselves generating the like quantity of electricity"; and, inferentially, upon the C.E.B. the duty of critical examination of the statement.

A Hypothetical Basis

As any such statement is necessary hypothetical, it offers opportunity for criticism, and must consume much valuable time of responsible officers of the claimant, as well as of the C.E.B. and of the Commissioners. This expenditure of time and energy is one of the complaints of the J.E.A. The process is tedious and cannot be regarded as a desirable normal incident of the annual settlements between the parties.

Incidentally, the report of the J.E.A. assumes some interpretations of the Act of 1926 which seem to me to be open to question. The only decisive interpretations will be those of the competent Courts if the questions are pressed to a decision. It would be better if they were resolved by some clarifying amendments of the Act of 1926. The charge made to the owners of selected stations in the repurchase of the energy they require is part of the plan for ensuring—as far as may be—that the C.E.B.'s operations shall be self-supporting from the commencement. The only compulsory customers of the Board at the beginning of trading are the owners of selected stations. Other customers become customers voluntarily, or under compulsion exercised by the Commissioners in circumstances defined by the Act. Hence the owners of selected stations in each C.E.B. area have at first to shoulder the bulk of the Board's administrative expenses. That burden may be expected to diminish as the Board's sales to other undertakers increase. The successive annual accounts of the Board indicate progressive increases of such sales, and it may be expected that the contributions of selected station owners to the expenses will dwindle.

Savings in Capital Charges

The largest factor in the all-over reduction of generating costs due to the C.E.B. operations so far has been the saving in capital charges upon generating plant, resulting from the combined working of selected stations so that spare capacity is pooled and available for peak and emergency loads in any part of the area. That saving is most directly beneficial to the undertakings whose stations have been shut down, or are run only for certain heavy load periods. That is not, on the whole, detrimental to the selected stations.

It may be admitted that some of the effects of C.E.B. working include some sacrifice from the most favourably placed undertakers for the benefit of those less favourably situated. That is not an entirely unexpected result; on broad grounds of public interest some measure of equalisation of production costs may be defended. I do not intend to express an opinion either way. The case of the West Midlands J.E.A. is peculiarly hard. There—uniquely—the undertakers did combine as intended by the Act of 1919, and carried out a plan which has had excellent results for all concerned. The superposition of the C.E.B. scheme upon theirs has put them in a worse position (so they claim) than if they had been left to themselves.

The best wish that can be made for the J.E.A. is that its "exports" to the C.E.B. will so increase as to bring about a substantial benefit, outweighing the addition of C.E.B. expenses to the generating costs. Such an increase seems to be in progress, as the last report shows that in the year 1936-37 the net export to the C.E.B. amounted to over 68 million kWh (about 13 per cent. of the total units sent out) against a net import of over 3 millions in the year 1935-36; the load factor has also shown improvement. The increase now in progress of 50,000-kW capacity at the very efficient Ironbridge station of the J.E.A. shows that the C.E.B. expects favourable development to continue.

The J.E.A. does not reflect on the "admittedly able administration" of the Central Board and concurs in the hope that it will benefit by the connection in future. It agrees that the situation complained of is the result of the statutory provisions under which the C.E.B. has to work. Those conditions can only be modified by Parliamentary action.

One may be permitted to make an observation rather like "I told you so." If the Act of 1919 had been used generally as it has been in the West Midlands there would have been no occasion for the Act of 1926. Whether the net ultimate results would have been better no one can say; it is a hypothetical question in the realms of "might have been" hardly worth discussion.

The Institute of Metals

The twenty-ninth annual autumn meeting of the Institute of Metals was held in Sheffield, under the presidency of Mr. W. R. Barclay, from September 6th to 9th. In addition to a lecture by Dr. D. R. Pye on "Metallurgy and the Aero Engine," eleven papers were presented for discussion. These mainly related to investigations in the metallurgy of non-ferrous metals. In a paper on "Methods of Testing Zinc Castings" Mr. L. Kenworthy described means for measuring their protective value from average weight, uniformity, structure and porosity. The recently developed Britton's electrolytic test has the advantage of removing the same weight of coating per unit time, irrespective of composition, with the same current density. The author regards it as the most satisfactory method yet published for measuring the properties of weight and distribution, provided that the material is in the form of sheet or wire, since it provides a quantitative evaluation of the distribution of the coating as apart from the average weight figures which are given by chemical stripping methods.

The Bakers' and Confectioners' Exhibition

FROM the weighing of the ingredients to the delivery of the finished product at the customer's door, practically every process in the making of bread, cakes, pies, &c., can to-day be carried out electrically. During the past week examples of the most up-to-date appliances have been on view at the Bakers', Confectioners' and Allied Traders' Exhibition held at the Royal Agricultural Hall, Islington.

By far the greatest number of electrically operated machines shown are for mixing, kneading, dividing and similar operations. Many minor improvements in design are noticeable, making for still more efficient, reliable and rapid operation. Increasing competition is causing more attention to be paid to appearance, streamlining being much in evidence. Among those displaying this type of equipment are W. E. Burnell & Sons, Ltd.; E. F. McCourt; Bristol Steam Oven Works, Ltd.; Ellerstyle Engineering Co., Ltd. ("Safermixer"); Kent & Co. (Globe Works), Ltd.; W. F. Mason, Ltd. ("Jem" and "Dot"); Dumbrill Plant & Engineering Co. ("Super Human"); Artofex Engineering Works, Ltd.; J. Crollie & Son, Ltd.; Kneeda Mfg. Co., Ltd.; and T. Errington & Sons, Ltd.

On one of the electrically operated weighing machines shown by Southall & Smith, Ltd., it is possible to handle accurately a ton of sugar an hour, while the latest type of automatic tea-weighing machine has a novel device for the control and collection of tea dust or fluff. Sifting and elevating plant is a speciality of William Gardner & Sons (Gloucester), Ltd.

Among pie- and tart-making machines we noticed a new model on the stand of C. O. Ericsson Engineering Works, Ltd. Like nearly all the company's machines, this depositor and moulder requires no oiling or greasing; it has its 4-h.p. motor and all gearing, &c., totally enclosed. A new type of guard has been fixed to another of this company's tart- and pie-filling machines. John Hunt (Bolton), Ltd., is again demonstrating its "Little Champion" machine, other types of pie-making equipment being shown by John P. Jackson & Co., Ltd., and the Camwheat Pie Machine Co., Ltd. Automatic electric doughnut machines are made by the British Doughnut Co., Ltd.

Special attention has been paid to the requirements of the smaller bakers, cafés, &c., by the production of several new appliances which make their first appearance among the comprehensive display of food preparation equipment exhibited by the Hobart Mfg. Co., Ltd.

Besides a very moderately priced peeler there is a general utility slicer, an outstanding feature of which is the facility of operation, adjustment and cleaning. The provision of a double tank for the washing and rinsing water in a new type of dishwasher eliminates a good deal of the usual installation work. A novelty in the way of coffee grinders is a bakelite and chromium machine which has an illuminated indicator showing the grade of coffee being ground.

Grey outlined with black is the new "uniform" of the Peerless Electrical Mfg. Co.'s products, among which are to be seen mixing, whisking, dishwashing, mincing, peeling and grinding machines and ovens. Push buttons and contactor control are being employed to an increasing extent on these appliances.

Electric baking is making good progress, more and more bakers appreciating its simplicity and efficiency. To its wide range of oven equipment the General Electric Co., Ltd., has just added a brick-built type which is cheaper to use than the steel models and more robust. A double-deck peel oven on the stand supplies the bread and rolls for the exhibition grill room and buffet. Demonstrations are given of a scone plate and an electrically heated chocolate dipper.

A completely automatic loaf-making plant, consisting of a divider, hander-up, automatic prover and multi-spindle moulder, forms the principal exhibit on the stand of Baker Perkins, Ltd., who are also showing a pastry dough brake of a new design and the "Integra" combined divider-moulder for small goods. Thomas Collins & Co., Ltd., are displaying one of their latest electric ovens, while Pelkman Bros., Ltd., are introducing a swing tray rotary oven and a new folding moulding machine. Electric steam injectors are obtainable from Humidor, Ltd., and bakery equipment of all kinds is made by Herbst. Push-button control from three places is provided on the latest bread slicers and wrappers, made by Rose Bros. (Gainsborough), Ltd. "Battle Creek" slicers and wrappers are demonstrated by C. S. Du Mont, Ltd.

Up-to-date shelf and floodlights for shops are featured by Geo. Allen & Co., and window displays cannot fail to attract attention if the electrical novelties available from J. C. King, Ltd., are used.

Electric vehicles are now rapidly coming into their own for the delivery of bread and four different makes can be inspected. Quick changing of batteries is an important feature of the "Metrovick" 18/22-cwt. model shown in chassis form, the whole process taking only ten minutes. This vehicle is of all-welded construction, has an insulated lead system throughout, and is fitted with a six-speed, series parallel controller. Complete 7/9-cwt. and 10/14-cwt. "Metrovick" vans are also shown.

A new type of charging plug is now fitted to a chassis demonstrated by Partridge, Wilson & Co., Ltd. This vehicle is equipped with a patent fluid automatic controller, giving pre-selected acceleration. Examples of standard types of vehicles suitable for the bakery and confectionery trade are shown by the Associated Electric Vehicle Manufacturers, Ltd., who control Electricars, Ltd., and A. E. Morrison & Sons, Ltd. "Cleco-electric" vehicles, batteries and rectifiers of the latest types are to be seen on the stand of the Electric Truck & Battery Co., Ltd.

The exhibition closes to-day (Friday).

Electricity Supply Co-ordination in London

AS we report in our City Notes to-day, on Friday last a resolution was passed at an extraordinary meeting of the City of London Electric Lighting Co., Ltd., approving an agreement between the company, the County of London Electric Supply Co., Ltd., the South Metropolitan Electric Light and Power Co., Ltd., and the South London Electric Supply Corporation, Ltd. In a circular, previously issued to stockholders, the objects of the agreement were fully explained.

The directors point out that the tenure and position of the electricity supply companies of London were settled by two Acts passed in 1925. The London Electricity (No. 1) Act, 1925, covered the "East End" group of companies, and the London Electricity (No. 2) Act, 1925, covered the "West End" group of companies. These Acts gave the companies wide powers to amalgamate or associate in schemes for joint working within their respective groups, and as a result the City of London Co. commenced negotiations with the County of London Co. with a view to the pooling of generating resources. The formation of the Central Electricity Board removed the possibility of such a pooling arrangement and the negotiations were discontinued, but the two companies have always maintained a helpful co-operation with each other.

Following the McGowan Report, the directors felt that modern developments in the electricity supply industry made it desirable that the City of London Co. should associate with other undertakings. In the autumn of 1936, therefore, the company entered into negotiations with the three other companies with which it had been linked by the Act of 1925, and has since concluded an agreement the chief provisions of which are as follows:—

(1) The undertakings of the companies shall, subject to the control of the directors, be jointly managed by a committee consisting of representatives of the four companies.

(2) There shall be an interchange of directors in order to further the joint operations of the companies.

(3) Certain inter-connections of existing mains shall be made so as to save capital expenditure and secure technical and other advantages.

(4) In all matters affecting consumers—tariff charges, assisted wiring, hire of apparatus, &c.—there shall, so far as is possible, be a common policy.

(5) Materials needed by the four companies shall be obtained through the existing buying organisation of the County of London Co., in order to secure the economies which arise from bulk purchases.

(6) The methods of accountancy of the four companies and other items of internal organisation shall be co-ordinated where practicable.

(7) The office accommodation, equipment and staffs of the four companies shall, where necessary and possible, be shared so as to achieve greater economy and efficiency.

(8) Existing capital expenditure shall be utilised to the fullest extent in the interest of all four companies.

The circular emphasises that there will be no interference with the capital structure of the City of London Co., or with the stockholders' rights which have prevailed since the passing of the Acts of 1925. Under the sliding scale laid down in the No. 1 Act benefits to customers should result in some additional benefit to the ordinary stockholders, but apart from this the position of stockholders will not be affected in any way.

Women's Engineering Society

The fifteenth annual conference of the Women's Engineering Society is to be held at Crosby Hall, Chelsea, London, from September 24th to 26th. The programme includes a visit to the Shipping and Marine Exhibition at Olympia and a "mystery tour."

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

Radio Retailers' Meeting

At the first annual general meeting of the National Association of Radio Retailers, held last week, Mr. H. E. Walker, the president, outlined the activities of the Association since its registration in September last year. He mentioned that its formation was due to N.E.C.T.A., Ltd., which was assured of the need for such an Association. It was the policy of the N.A.R.R. to secure fair trading conditions throughout the industry, and the Council was exploring means of getting an agreed policy with the co-operation of other sections of the trade. It was also the aim to improve the status of the genuine radio retailer, and members were asked to assist in this by popularising the designation "Registered Radio Retailer," which they were entitled to use. The part exchange question had been dealt with, and discussions regarding the battery position were taking place with the A.R.B.M. Branches were in existence at Leicester, Cardiff, Luton, Croydon, Portsmouth, Birmingham and Tunbridge Wells, and the work of setting up others was being proceeded with.

Commercial Visitors to India

As the usual time for business visits to India is approaching, the attention of United Kingdom firms is drawn to the facilities which the Trade Commissioner Service can afford. Sir Thomas Ainscough, C.B.E., H.M. Senior Trade Commissioner in India and Ceylon, and his colleagues Mr. W. D. M. Clarke (Bombay) and Mr. A. Schofield (Calcutta) are in an excellent position to render assistance, either to principals undertaking a special mission of investigation, or to commercial representatives who are developing the sale of goods of United Kingdom manufacture in India. The Department of Overseas Trade will be pleased to provide letters of introduction to the Commissioners in question. In addition, an officer of the Indian Section of the Department in London will be pleased to discuss proposed tours with a view to rendering assistance not only as regards market conditions obtaining in India at the present time, but also, if desired, concerning the itinerary, outfit, and other matters.

Electricity House, Bradford

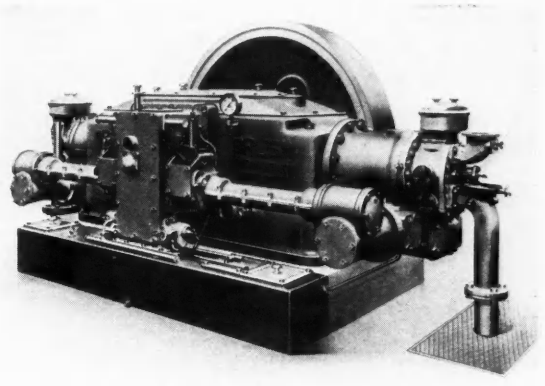
Situated in one of Bradford's main shopping streets the new showrooms of Electricity House, Ltd., have a long and wide arcade entrance with ten display windows. The ground floor opening from the arcade is very inviting with its cream walls and palest pink screens and cubes on which are displayed the electrical appliances and radio sets. The demonstration room on the first floor is large and well lighted and displays coloured cookers and refrigerators. Adjoining this room and leading through a wide archway is a further showroom with a comprehensive display of lighting fittings and table standards. Mr. W. B. Woodhouse, the company's managing director, together with Mrs. Woodhouse and several other directors and prominent Bradford residents attended the pre-view. Miss Marjorie Bolton (E.A.W. Diploma) is in charge of the showrooms and is giving parties to housewives each Tuesday and Friday afternoon, when she will talk about the many and varied uses of electricity including cooking, washing and refrigeration demonstrations. Mr. J. E. Rylands is the general manager of Electricity House, Ltd.

Illumination Design Course

The thirty-sixth Illumination Design Course will commence on October 11th at the E.L.M.A. Lighting Service Bureau, 2, Savoy Hill, London, W.C.2, and lectures will be given on consecutive Monday evenings. The subjects to be dealt with are as follows:—October 11th: "Better Light—Better Sight." October 18th: "Electric Lamps, Their Characteristics and Economics." October 25th: "Fundamental Lighting Terms and Illumination Design." November 1st: "The Value of Good Lighting in Industry." November 8th: "A Survey of Commercial Lighting Practice." November 15th: "Architectural Lighting, its Evolution, Theory and Practice."

Quick Delivery

We recently recorded the destruction by fire of the power station of the Machynlleth Electric Supply Co., Ltd. The fire occurred on August 4th and an order was immediately placed with the Brush Electrical Engineering Co., Ltd., for a Diesel engine set, similar to one which we now illustrate. This comprised a 100-b.h.p. engine and 58-kW alternator, complete with switchboard and switchgear. Following the fire the electricity supply was completely cut off, and consumers were promised a renewal of supply by August 24th. The Brush Company, however, was able to deal with the order in such a manner that the complete plant was delivered to the temporary power station site, and the electricity supply was restored in nine days.



A Brush Diesel engine of the type supplied to the Machynlleth Electric Supply Co., Ltd.

New Showrooms at Redcar

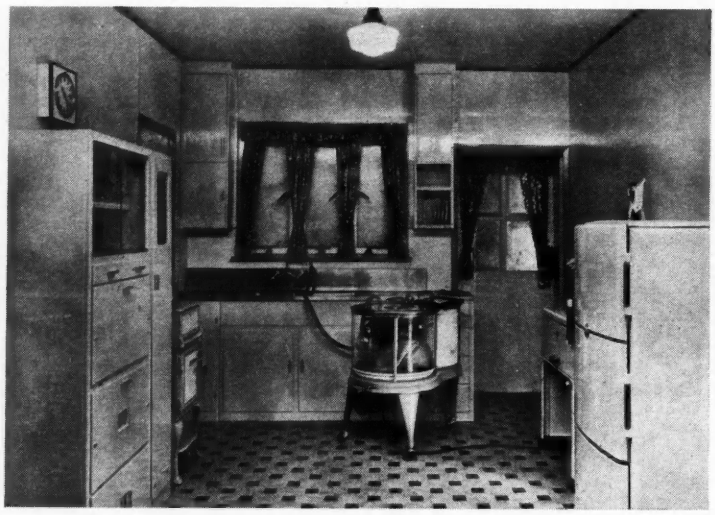
The new showrooms of the Redcar Corporation Electricity Department were formally inaugurated on September 1st by Ald. W. Morris, chairman of the Electricity Committee, with the Mayor (Councillor J. R. Nixon) presiding. An electricity supply for Redcar was commenced in 1924, when there were less than 100 consumers. To-day the annual sales are approximately 2¼ million kWh and 90 per cent. of the houses and business premises are connected to the system. The new showrooms, situated in the main thoroughfare, are built in modern style. In addition to large display windows in the front of the premises, there are windows along nearly the whole length of the arcade, which provides communication

An exterior view and the lighting fittings showroom of Electricity House, Bradford

between High Street and Lord Street. The showrooms include a large display room, a demonstration hall, offices and stores, and the whole of the administration of the Electricity Department has been centralised. Mercury vapour lamps, in conjunction with ordinary gas-filled lamps, are used to illuminate the windows, enabling the appliances to be inspected at night under daylight conditions. A new alternative to the flat rate has recently been introduced. This consists of a standing charge of 15 per cent. of the rateable value of premises, plus a "unit" charge of ¾d. for all electricity consumed. The electrical engineer is Mr. J. A. O'Brien.

Social Event

On September 2nd the Leeds Electrical Club met the Sheffield Electrical Club in a golf match on the Wetherby golf course for the Prentice trophy. After a keen match the Sheffield Club beat the Leeds Club, holders of the trophy, by seven to five. The match was followed by a meal and a smoking concert. The Prentice golf trophy is available for competition between members of electrical clubs whose premises are within approximately 100 miles radius of Leeds. The challenger must visit the town of the club holding the trophy.



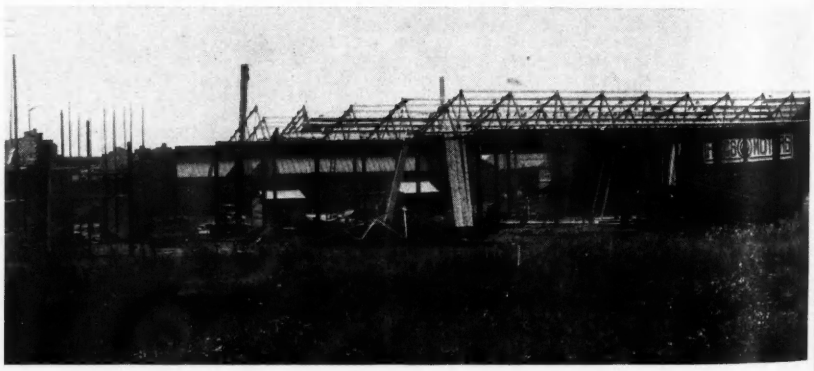
The model electric kitchen at the showrooms of Apex-Vactric, Ltd.

United States Electrical Imports

The exports of electrical machinery and allied goods and apparatus from the United States during the first half of the current year attained a value of £11,020,000, as compared with £8,700,000 in the corresponding six months of 1936.

Higgs Motors Extensions

Higgs Motors, Ltd., have made continuous and rapid progress during the past seventeen years, and since 1927 twelve major extensions have been made to the factory. Our picture shows the latest extensions to the machine shop, a further 16,000 sq. ft. being now in course of construction. The company's factory is devoted exclusively to the manufacture of electric motors, dynamos and parts and accessories. The actual developed area is about seven acres out of the total of fourteen acres which the company has available.



Extensions in progress at the works of Higgs Motors, Ltd., Witton, Birmingham

Heating in S.S. "Orcades"

As mentioned in the account of the electrical equipment on the *S.S. Orcades*, which appeared in our issue of August 27th, "Thermovent" heaters are widely used in the vessel. E. K. Cole, Ltd., who have taken over the Thermovent business, inform us that about 800 500-W units of the panel type are fitted for alley-way heating. Many are fitted with dual escape grilles to heat the cabins at the other side of the bulkhead also. The Thermovent system, which has received the approval of Lloyd's, is also fitted in the Orient liners *Orion* and *Orontes*. As a result of satisfactory experience with the system in the *Queen Mary* it is to be installed in the sister ship now in course of construction.

Installation Prices at Southport

The Southport Corporation Electricity Committee has revised the amounts payable to electrical contractors under the assisted wiring scheme and for the fixing of water heaters as follows: Up to and including 10 lights, £1 1s. 3d. per point, and up to and including 12 lights, £1 1s. 0d. per point (including one two-way switch). Extra for additional two-way switches, 9s. 9d. each. The price for the fixing of water heaters and control switch is being increased from 8s. 6d. to 9s. 3d. each, and orders for the fixing of water heaters are to be carried out by a plumber-electrician or the electrician who is actually carrying out the wiring for the water heater, providing he is a member of the Southport Electrical Contractors' Association or is a registered electrical contractor.

A Model Electric Kitchen

An all-electric model kitchen has been constructed in the showrooms of Apex-Vactric, Ltd., at 149, Regent Street, W.1, for demonstrations of Vactric and Apex-Vactric products. Its electrical equipment includes a refrigerator, ironer, washer, vacuum cleaner, cooker and clock. Demonstrations of washers and ironers are given so that customers can see how the apparatus works in the correct surroundings. Salesmen also receive instruction in the operation of new products in this kitchen.

Electrical Works in Manchukuo

A special correspondent informs us that charters have been granted by the Manchukuo Government for the establishment of five electrical equipment manufacturing companies as affiliated plants of leading Japanese concerns. With the rapid progress of electric power generation in Manchukuo, no little interest is centred on the projected inauguration of the new heavy engineering industries of the country. In consideration of the importance of these enterprises, in the light of the present-day national policy encouraging industrial developments, the Government has decided to exempt them from the operation of the Staple Industry Control Act. Construction work is expected to start during this autumn. All plants will be established in Mukden. Japanese companies taking part in the new industries include the Shibaura Electric Works, which will establish the Mukden Electric Works, with a capital of 2,000,000 yuan; the Metro Electric Lamp Manufacturing Company, which will establish the Meiteh Electric Lamp Manufacturing Company, with a capital of 500,000 yuan; the Fuji Electricity Company, which will establish the Kufen Kungszu, with a capital of 1,000,000 yuan; the Tokyo Electricity Company, which will establish a branch factory, with a capital of 2,000,000 yuan; and the Nihon Electricity Company, which will establish the Manchuria Communications Instrument Company, with a capital of 1,000,000 yuan.

Porcelain Cables in Germany

A *Reuter* message from Berlin states that an electric cable made entirely of German raw materials and insulated by flexible porcelain tubes is now undergoing tests at Annaberg, in Saxony. The porcelain tubes are about 6 ft. long and the connecting parts are made of artificial rubber (Buna). The tests so far have been very successful, it is claimed, and it is foreshadowed that in the near future new cable lines will be insulated entirely by porcelain tubes.

An Electric Vehicle Exhibition

A conference on electric vehicles was held in Bridlington Town Hall on September 1st, the Mayor (Ald. A. E. Figg) presiding. Ald. Figg, who is chairman of the Electricity Committee, referring to the advantages of the electric vehicle, said that Bridlington's tariff for charging vehicle batteries was ½d. per kWh, with no restrictions. Mr. J. N. Waite, of Hull, chairman of the Area Electric Vehicle Committee, spoke on his experiences with a fleet of fourteen vehicles. The perform-

ance of these vehicles had been carefully watched, and comparative costs of electrically and petrol-driven vehicles (costs adjusted to 10,000 miles in twelve months' running) were as follows:—

	Electric vehicles. d.	Petrol vehicles. d.
Total fixed costs	1.6249	1.6285
Total running costs	0.3928	1.5017
Total cost per mile	2.0177	3.1302

The fixed costs included depreciation and interest charges calculated at 3 per cent. sinking fund and 4 per cent. interest on the following lives: Petrol vehicle (cost £180), five years; electric body and chassis (cost £195), ten years; and electric battery (cost £70), three years. The running costs include petrol calculated at 1s. 3d. per gallon and electricity at ½d. per kWh. Within their limits, electric vehicles were cheaper and more efficient than petrol vehicles. Mr. E. E. Grant, representing electric vehicle manufacturers, also spoke. The exhibition was open for two days and several inquiries were dealt with.

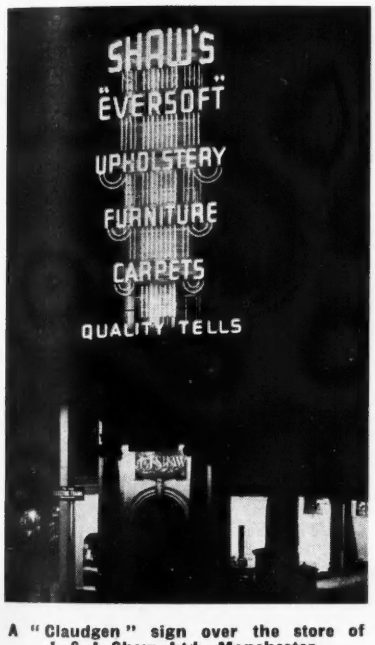
Trade Announcements

Earle, Bourne & Co., Ltd., are removing their London office on September 29th to 21, Lincoln's Inn Fields, W.C.2 (telephone: Chancery 7862/3; telegrams: Earlbotube, Holb., London).

Underwood (Manchester), Ltd., Dickinson Street, West Manchester, have been appointed sole distributors for all Apex-Vactric, Ltd., and Vactric, Ltd., products in Birmingham and Leicester. The company will handle the newly added range of vacuum cleaners, refrigerators, washers, and ironers in Warwickshire, Shropshire, Staffordshire, Worcestershire, Leicestershire, Derbyshire, Notts, and Northants, as well as in North Wales. It will continue to handle other lines of electrical equipment as wholesale factors.

A Large Neon Installation

The accompanying illustration shows a recent "Claudgen" neon installation erected over the store of J. & J. Shaw, Ltd., Manchester. Over 550 ft. of "Cleora" fluorescent tubing is used on this sign. Rounded block teak letters are used, "Shaw's" graduating from 3 ft. 4 in. to 2 ft. 9 in. in height. The words "Shaw's" and "Quality Tells" are illuminated by 15-mm. "Cleora" fluorescent tubing No. 22 green, and the remainder with 15-mm. No. 102 pink tubing. Nos. 25 (lime green), 103 (amber) and 22 (green), all 20 mm., are used for the illuminated bank between the words.



A "Claudgen" sign over the store of J. & J. Shaw, Ltd., Manchester

Swedish Electrical Industry in 1936

According to a preliminary survey of industrial production in 1936 issued recently by the Swedish Board of Trade, the output of the electrical manufacturing companies was increased by approximately 10 per cent. as compared with 1935. The number of electric lamps manufactured was 14½ millions, which is about 1.3 millions more than in 1935. The cable industry manufactured 24,670 tons of all kinds of electric cable and insulated wire, as against 23,332 tons produced in 1935. The aggregate value of other principal electrical goods manufactured in 1936 was £5,773,600, or £534,300 in excess of the preceding year's figure. Major increases of output have taken place in transformers, convertors, switchgear, and telephone and telegraph equipment, while the output of vacuum cleaners and accumulators shows decreases. The following details of production are given.

	Value in thousands of £. 1936.	1935.
Generators and motors	1,440	1,287
Transformers and convertors	503	395
Resistances, switchboards, etc.	398	396
Switchgear	303	193
Heaters	201	186
Accumulators and parts	274	284
Wireless	1,052	1,027
Telephone and telegraph equipment ...	1,034	830
Vacuum cleaners, etc.	567	640

Lift Contracts

Marryat & Scott, Ltd., have secured the contract for the complete lift installation at the Nicosia Hospital, Cyprus. The company has also received the order for the lifts at the Coventry and Warwickshire Hospital, Coventry.

Sectional Poles

In our issue of August 21st, 1936, we described a type of hollow sectional steel pole for carrying overhead lines and as lamp standards, made by Poles, Ltd., under the name of

A consignment of "Adastra" sectional poles ready for delivery

"Adastra." In the accompanying illustration we show a recent order for fifty-five "Adastra" poles, complete with wishbone type crossarms, bolts, nuts, &c., all loaded on to one lorry. The materials are sufficient for a h.v. transmission line approximately three miles in length.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price. September 8th	Fortnight's Inc. or dec.
a Acid Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£36	—
a Ammonia, Muriate (large crystal)... ,,	£18 10s.	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£22 10s.	—
a Potash, Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac ... ... per cwt.	£4 18s.	—
a Sulphur, Commercial ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda, Chlorate ... ... per lb.	3¼d. to 3¾d.	—
a ,, Crystals ... . per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. net.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil... ... ,,	1/3 to 2/9	—
p Babbitts Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£249	—
Grade II ... ... ,,	£172	—
Grade III... ... ... ,,	£91	—
c Brass (rolled metal 2" to 12" basis)... per lb.	9⅛	¼d. dec.
c ,, Tubes (solid drawn) ... ... ,,	1/0¼ to 1/0¾	¼d. dec.
e ,, Wire, basis ... ... ,,	9⅞	¼d. dec.
c Copper Tubes (solid drawn) ... ,,	1/2	¼d. dec.
g ,, Bars (best selected) ... per ton		
g ,, Sheet... ... ... ,,	£91	£2 dec.
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£67 10s.	—
d ,, ,, Wire Rods ... ,,	£72 10s.	—
d ,, ,, H.C. Wire ... per lb.	10 5/8d.	—
f Ebonite Rod ½" dia. & up ... ... ,,	1/10 to 2/9	—
f ,, Sheet ⅛" thick & up ... ,,	1/7 to 1/10	—
n German Silver Wire, Nos. 1 to 12... ,,	2/5	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para-fine ... ... ,,	9¼d.	—
i Iron, Pig (Cleveland, No. 3) ... per ton	£4 5s.	—
i ,, Wire galv. No. 1, P.O. Qual.... ,,	£23	—
g Lead, English Pig ... ... ,,	£23 15s.	10s. dec.
g Mercury ... ... per bot.	£13 12s.	—
e Mica (in original cases) small ... per lb.	10d. to 2/–	—
e ,, ,, ,, medium ... ,,	6/– to 12/6	—
e ,, ,, ,, large ... ,,	13/– to 17/6 up	—
p Phosphor Bronze, plain castings ... ,,	1/3¾	—
p ,, ,, drawn bars & rods ,,	1/3	1d. dec.
p ,, ,, rolled strip & sheet ,,	1/1	1d. dec.
p ,, ,, wire ... ... ,,	1/2½	¼d. dec.
o Platinum ... ... per oz.	£10 5s.	—
d Silicium Bronze Wire ... ... per lb.	11¼d.	—
g Spelter ... ... per ton	£22 18s. 9d.	£1 6s. 3d. dec.
r Steel, Magnet, in bars ... ... per lb.	7¼d.	—
g Tin, Block (English) ... ... per ton	£260 15s.	10s inc.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	4/3	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
j India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in our "Business Notes" under the same heading.

I.F.S. Electrical Imports

Imports of electrical goods and apparatus into the Irish Free State during the first seven months of this year show an upward trend as compared with the January-July period of 1936. Notable among the increases are those under the headings "broadcast receivers, fully manufactured," from £33,705 last year to £50,489 in 1937, and "telegraph and telephone apparatus." The large scale developments planned by the Irish Free State Telephones Department are reflected in the import figures for this year under this latter section of £58,615, as against only £5,962 during the seven months January-July, 1936. Imports of electric lamps dropped from £33,969 to £14,506, due mainly to the Government's policy of restricting the imports of these goods as an aid to developing home production. The following are the various imports for the two periods under review:—

	January–July, 1936.	1937.
	£	£
Electrical machinery:		
Motors	31,636	34,618
Other sorts, not enumerated separately	119,955	135,443
Dry batteries, complete	6,891	8,643
Dry batteries, parts of	2,375	1,884
Electric lamp bulbs	33,969	14,506
Electric lighting accessories, fittings and parts	49,824	47,569
Electric wires and cables, insulated	51,936	53,645
Telegraph and telephone apparatus, n.e.s.	5,962	58,615
Wireless telegraph apparatus:		
Broadcast receivers, fully manufactured	33,705	50,489
Radio gramophones, fully manufactured	822	621
Other sorts, fully or substantially assembled	4,702	5,452
Component parts and acressories	40,855	55,268
Other electrical goods and apparatus	156,616	203,598
Total	£539,248	£670,351

A New Clock Catalogue

Bound in a stiff black cover, the new 80-page clock catalogue of T.M.C.-Harwell (Sales), Ltd., is a handsome production. Each clock model is given a separate sheet, the illustration being about 6 in. across, with a specification below. A loose-leaf arrangement is adopted which facilitates removals and additions.

New Catalogues and Lists

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—A 64-page illustrated catalogue of "Osram" lamps.

Berry's Electric, Ltd., Touchbutton House, Newman Street, London, W.1.—A 47-page catalogue of electric fires illustrated in colour.

Time Switches & Instruments, Ltd., 120, Victoria Street, London, S.W.1.—A leaflet dealing with the type "SN" time-switch.

W. T. Glover & Co., Ltd., Trafford Park, Manchester, 17.—A leaflet describing unsoldered joints for the repair of protective screens in trailing cables.

British Klockner Switchgear, Ltd., London, S.W.8.—A leaflet dealing with new interlocking contacts and limit switches.

Lunken Co., Ltd., 35, Great Dover Street, London, S.E.1.—Details of an improved hand tachometer.

Falk, Stadelmann & Co., Ltd., 83/93, Farringdon Road, London, E.C.1.—A catalogue of new season's fires and domestic appliances.

Kandem Electrical Co., Ltd., 769, Fulham Road, London, S.W.6.—Pamphlets dealing with the "Kapari" measuring bridge, "Pyropto" optical pyrometer, and "Isolavi" insulation tester.

Berkeley & Young, Ltd., Tyseley, Birmingham.—Leaflets dealing with fans, the "Button Groove" iron, "Dinkie" fire and electrically heated aquaria.

Holophane, Ltd., Elverton Street, Vincent Square, London, S.W.1.—Catalogue No. 170, containing illustrated details of a number of new street-lighting units with distribution and iso-foot-candle diagrams and an abstract from B.S.S. No. 307. Particulars of standards and fittings are included.

Bankruptcy Proceedings

S. Holmes, 37, Downing Street, South Normanton, Derbyshire, formerly 41, High Street, South Normanton, electrical and wireless engineer.—At the first meeting of creditors herein held on September 3rd at the Official Receiver's Office, 22, Regent Street, Park Row, Nottingham, debtor attributed his failure to lack of capital, bad debts, inexperience, heavy legal costs in respect of debts for which he had been sued, and losses sustained on resale of goods repossessed by him under hire-purchase agreements for which he was a guarantor. His deficiency amounted to £545. The matter was left in the hands of the Official Receiver.

H. G. Hayward (Modern Electric Service), electrical engineer and radio dealer, 42, Wilton Avenue, Southampton, lately trading at Cambridge Road, Southampton.—First and final dividend of 1s. 2d. in the £, payable September 8th at 10, Rockstone Place, Southampton.

H. W. Fletcher, wireless dealer, 233, Normanton Road, Derby.—First meeting held September 9th at 22, Regent Street, Park Row, Nottingham. Public examination September 21st at 20, St. Peter's Churchyard, Derby.

G. Howarth, radio engineer, 36, Union Street, Bury.—Last day for receiving proofs for dividend September 15th. Trustee, Mr. P. M. Milward, Byrom Street, Manchester, Official Receiver.

H. Yewdall, electrician, 573, Meanwood Road, Leeds.—Receiving order made September 1st on debtor's own petition.

Company Liquidations

E. Marshall, Ltd.—Winding up voluntarily. Liquidator, Mr. W. W. Hodgson, 35, Copthall Avenue, E.C.2.

Kingsway Electricals, Ltd.—Meeting October 5th at 3 to 9, Dane Street, High Holborn, W.C.1, to receive an account of the winding-up by the liquidator, Mr. C. Russell.

Electricity Supply

Lighting, Domestic, Power

Australia.—MELBOURNE.—Mr. J. C. Lane, city electrical engineer of Melbourne, reports that last year connections to the mains increased by 9,410 kW to 178,063 kW and consumers by 668 to 29,968. Sales of energy rose by 8 per cent. to 136.8 million kWh. Electricity sold for lighting accounted for 38 per cent. of the total revenue. There was some improvement in power supplies, especially under the prescribed hour night rate. Domestic supplies increased by 10 per cent., there being a marked change over to the two-part tariff (+113 per cent.). Most of the energy was obtained from the State Electricity Commission in bulk, but the Council's own steam plant supplied 33.9 million kWh. Full use was made of the new 5,500-kW Parsons turbo-alternator, the higher operating efficiency of which, compared with older sets, had the effect of increasing the overall thermal efficiency.

Bethesda (North Wales).—ELECTRICITY CHEAPER.—The price of electricity for lighting has been reduced from 4d. to 3d. and for power from 2d. to 1d. per kWh.

Birkenhead.—SUB-STATIONS.—The Electricity Committee has purchased sub-station sites at Gayton and Spital.

C.E.B. SCHEME NOT ACCEPTABLE.—Further consideration has been given by the Electricity Committee to the request of Cammell Laird & Co., Ltd., for an increased bulk supply of electricity. The Central Electricity Board has intimated that it is not prepared to quote special terms for this supply under Section 2 of the Electricity (Supply) Act, 1935, but to enable the Corporation to furnish a supply to the company at a lower rate it has made certain financial proposals. These would involve the Bentinck Street generating station being closed down, the Corporation taking all future supplies from the Board, which would rent a considerable site at Bentinck Street and Craven Street for the accommodation of its proposed new 33,000-V switchboard. The Committee has decided not to accept these proposals, and it is informing Cammell Laird & Co. that it cannot revise the terms already offered to the company.

Burnley.—DISTRIBUTION.—Much of the activity of the mains department during the past year has been in developing the low-voltage network in the rural area, which has been made possible by the high-voltage line constructed last year to deal with the demands of the Enfield Brick and Terra Cotta Co., and the Towneley Coal and Fireclay Co. The demand for electricity by the residents in this area has been gratifying, and few houses or farms will be lacking a supply by the end of the present year, states Mr. J. E. Starkie, the borough electrical engineer. During last winter a high-voltage cable was laid to the Thursden Valley to supply a pumping station belonging to the Rural District Council. This has enabled low-voltage supplies to be furnished to cottages and farms in the area. Neither in the Cliviger Valley nor in the Thursden area has the request for such supply to isolated premises been refused, and the charges are the same as, or very little different from, those charged to consumers adjacent to the generating station. The duplicate mains to Harle Syke and the Casterton Avenue area *via* Colne Road are likely to be finished before the coming winter.

DOMESTIC HEATING.—Owing to the large number of radiators in use weather conditions considerably affect domestic sales. The maximum load on the undertaking increased from 7,720 kW on Monday, December 23rd, 1935, to 8,250 kW on November 23rd, 1936. The maximum day temperatures on the two days were 31 and 34 deg. respectively. As the kWh sold increased by 16.75 per cent. for this increase of 6.78 per cent. in peak load, the result may be considered very satisfactory.

Camborne-Redruth.—BETTER LIGHTING.—An offer of the Cornwall Electric Power Co. in connection with street lighting has been accepted by the Camborne-Redruth Urban District Council. The terms submitted include improvements in public lighting by the provision of new standards, rearrangement of certain main road lighting and increasing the size of some of the lamps.

Canada.—HYDRO-ELECTRIC PRODUCTION.—Hydro-electric production in Canada, which last year attained a record volume, is again increasing, and figures for the first six months of 1937 show an improvement of 10.5 per cent. The total output of central electric stations supplying 90 per cent. of the energy generated was 13,750 million kWh.

Cheltenham.—LOANS.—The Electricity Committee has obtained sanction to borrow £1,169 for transformers and £1,390 for a supply to Gotherington.

Chester.—AUTUMN ILLUMINATIONS.—Approximately 15,000 lamps are used for the autumn illuminations, which are stated to be more artistic than ever. The River Dee is bridged by festoons of light, while there is a new display of water effects.

Clayton-le-Moors.—CHANGE TO ELECTRICITY.—A draft agreement with the Accrington Corporation for a change-over from gas to electric street lighting has been approved by the Urban District Council.

Cotherstone.—ELECTR'C STREET LIGHTING.—The Parish Council has been authorised by the ratepayers to introduce an electric street lighting system. The supply will be obtained from the North-Eastern Electric Supply Co., Ltd.

Croydon.—FURTHER SODIUM LIGHTING.—Extensions of the sodium lighting system authorised by the Council include the installation of 133 100-W "Philora" lamps in Wardle "Liverpool" lanterns on South Norwood Hill and Beulah Hill, and forty-one similar units in White Horse Lane. They will be 90ft. apart and 25ft. high, on catenary suspension.

Darwen.—MAINS AND SERVICES.—The Corporation is seeking permission to borrow £16,238 for extensions to mains and services. Extra-high-voltage cables, switchgear and transformers are being provided at the north end of the town, at a cost of £6,675.

Denmark.—ATTEMPT TO STANDARDISE A.C.—At the recent annual meeting of the Association of Danish Electric Power Companies it was agreed that efforts should be made to standardise a.c.

Derwent.—LIGHTING SCHEME.—It is proposed to extend the electric lighting system at Barlby, and the Derwent Rural District Council is applying for the necessary powers.

Durham.—PROPOSED CONFERENCE.—On the suggestion of the Sedgefield Rural District Council local authorities in the county are considering holding a conference to discuss the question of electricity mains being placed underground instead of overhead. The Easington Rural District Council has decided to take part if such a conference is held.

Eastbourne.—EXTENSIONS.—The Electricity Committee has obtained sanction to borrow £5,145 for extending the supply to the Drayco estate at Polegate.

Glasgow.—SUB-STATION.—The Clyde Valley Electrical Power Co., Ltd., is to erect a sub-station in Tweedsmuir Road.

Hove.—ELECTRICITY CHARGES.—The following reductions have been recommended by the Electricity Committee: General lighting, from 3¾d. to 3½d. per kWh.; general lighting (prepayment meters), from 4¼d. to 4d. per kWh; rental and assisted-wiring consumers, "unit" charge to be reduced from 1d. to ¾d.; domestic and business tariff consumers, "unit" charge for the summer quarters to be reduced from ½d. to ¼d.

Lancaster.—SUB-STATION.—The Corporation is to erect a sub-station near Corless Mill.

Latvia.—NEW WATER-POWER PLANT.—Nearly 1,500 men are at work on a large new water-power station at Kegums, on the River Daugawa. It is expected that the station will be finished in about two years.

Liverpool.—ELECTRICITY FOR PUMPING.—Terms for a supply of electricity to a pumping station at Great Crosby have been approved by the Lighting Committee. H.v. and l.v. mains are to be laid at a total estimated cost of £3,143, and £1,050 is to be spent on equipment to be installed in three sub-stations.

LOAN.—The Electric Power and Lighting Committee has received sanction to the borrowing of £75,000 in respect of expenditure on consumers' electrical apparatus.

Manchester.—SUB-STATION PLANT.—Sanction is being sought by the Electricity Committee to a loan of £50,000 for sub-station plant.

Newcastle-on-Tyne. — ILLUMINATED BEACONS BANNED. — The Ministry of Transport has refused to allow the City Council to illuminate Belisha beacons at pedestrian crossings. In a letter to the Watch Committee the Ministry states that it is impossible to give sanction to a scheme which would mean that Newcastle's beacons would not conform with those in other parts of the country. The Ministry contributes 60 per cent. of the cost of the beacons.

Newport (I.O.W.). — EXTENSIONS. — The Isle of Wight E.L. & P. Co., Ltd., proposes to erect overhead lines at Clatterford Shute. The local branch of the Council for the Preservation of Rural England has suggested the possibility of underground cables being used if the Corporation will agree to forego any road reinstatement charges. The Corporation has arranged to discuss the matter with the company.

North Berwick.—ELECTRICITY CHARGES REDUCED.—The flat rate for lighting has been reduced from 8d. to 7d. per kWh, and the second step of the combined rate has been halved so that the third step of 1d. per kWh is reached more quickly. A special summer water heating rate of ¾d. per kWh has also been introduced to encourage the use of immersion heaters in hot water tanks. This concession was only passed after a claim by the convener of the Gas Committee that it would injure the Gas Department had been refuted.

Norway.—POWER STATION DESTROYED BY FIRE.—The Svelgfoss hydro-electric station, which belongs to the Norsk Hydro concern, was destroyed by fire recently. Built in 1905-07, it utilised a 48 metres fall, and the plant comprised four 10,000 h.p. sets (double Francis drum turbines driving 10-kV alternators). Only the turbines were saved. The damage amounts to more than a million kroner.

Poland.—NEW POWER PLANTS.—The Polish Government has outlined a four-year scheme aiming at further industrialisation of the country. A large new industrial centre is now being planned in Middle Poland, in the area between the rivers Weichsel and San. In order to meet power demands a number of hydro-electric stations will be erected.

Rothes.—ELECTRICITY INTRODUCED.—The Moray Road Board has agreed to electricity being introduced to Rothes by overhead cables.

Russia.—GIGANTIC WATER-POWER STATION.—Work is now being started on the erection of a water-power station on the River Volga, near Saratov, which will be equipped with twenty-six 60,000-kW generating sets. The annual output will exceed that of the Boulder Dam plant in the United States.

Scarborough.—SUB-STATIONS.—A site is to be acquired by the Electricity Committee in the vicinity of Aberdeen Walk for a sub-station, and sanction has been received to a loan of £2,541 for the provision of a sub-station at Wheatcroft.

Sheffield.—DEVELOPMENT.—During 1936-37 the Electricity Department extended its mains by 69 miles, bringing the total mileage now laid up to 2,224. The load connected to the system for all purposes at March 31st last amounted to 471,460 kW, an increase during the year of 31,535 kW. Meters installed increased during the year by 7,748 to 172,349. For street lighting purposes, 1,198 additional lamp standards were erected, making the total 8,533. Consumers increased by 7,205 to 151,015 and consumption rose by 18 per cent. to nearly 477 million kWh. The average cost per kWh sold decreased from 0.639d. to 0.577d. and the price obtained from 0.707d. to 0.671d.

GENERATION DATA.—In his report for the past year Mr. J. R. Struthers, general manager and engineer, shows that 56 per cent. more electricity was generated at Sheffield than in 1935-36, the total being 541.6 million kWh. Fuel consumption per kWh generated was reduced from 1.646 lb. to 1.404 lb. Further improvement was effected in regard to kWh lost in transmission, &c., which amounted to 7 per cent. of the output of the stations, as compared with 7.9 per cent. in the previous year. During the year provision was made for building extensions to the turbine house at Blackburn Meadows to accommodate one 30,000 kW turbo-alternator of the English Electric Co.'s manufacture, and one 50,000 kW turbo-alternator provided by the Metropolitan-Vickers Electrical Co., and this building is nearing completion; also No. 2 boiler house to accommodate three new boilers. The whole of the railway siding accommodation at the station has been reconstructed, and new coal handling plant for the No. 2 boiler house has been ordered. At the Neepsend generating station extensions have been in progress during the year consisting of one 30,000-kW turbo-alternator of the British Thomson-Houston Co.'s manufacture, and two 187,500 lb. per hour Stirling water-tube boilers. To meet modern conditions a complete overhaul of the switchgear is in progress, and a new switchroom is being constructed to house the main high-rupturing capacity switchgear units with reactors. This work is nearing completion, and it is expected that the station extensions will be in commission at an early date. One 3,500,000 gal. per hr. cooling tower has also been constructed.

SUB-STATION.—The Electricity Committee is to erect a sub-station in Radford Street at a cost of £1,440.

South Shields.—ILLUMINATIONS.—The annual illuminations display in the South Marine Park was brought into operation on September 4th, and will continue to September 19th. About 12,000 electric lamps are used.

Stalybridge and District.—NEW TARIFF.—The Stalybridge, Hyde, Mossley and Dukinfield Tramways and Electricity Board has approved a new tariff for electricity used in licensed premises and clubs as an alternative to the flat rate now being charged. Under the new tariff the lighting charge varies from 6d. per kWh for the first 91 kWh to ½d. per kWh according to the amount used.

Stokesley.—EXTENSIONS.—The Rural Council has agreed not to oppose plans by the North-Eastern Electric Supply Co., Ltd., for the extension of overhead lines at Ormesby.

Sweden.—ALL-ELECTRIC MINING TOWN.—At Nya Boliden, near Lulea, where there are large copper mines, the homes of employés are all-electric, containing electric cookers, refrigerators, radiators, water heaters, and a number of other household appliances. In addition, all the machinery at the mines is electrically operated.

West Wemyss.—STREET LIGHTING.—The streets of the Fifeshire village of West Wemyss, which was in darkness during last winter through the change-over from gas to electricity, are now lighted by electricity. The Council sold the gas street lamps before the arrangements were completed for laying the cable, with the result that the inhabitants were compelled to use miners' lamps, hand torches, and candles.

Williton (Somerset).—OVERHEAD EXTENSIONS.—The Rural District Council has given its consent to the proposal of the Minehead Electric Supply Co. to erect an overhead line from Allerford to Bossington.

Workington.—JOINT COLLECTION FROM GAS AND ELECTRICITY METERS.—Reporting on the collection of money from prepayment meters, the borough treasurer recommends a joint system covering gas and electricity meters.

Traction

Australia.—MELBOURNE.—The Melbourne Metropolitan Tramways Board has decided to convert the cable tramway system along Bourke Street to electric traction in conformity with the remainder of the Melbourne tramways, states the *Electrical Engineer and Merchandiser*. The work will involve nearly eight miles of track and cost £550,000. It will not be commenced for about twelve months, and when it is completed there will be only one cable route remaining in Melbourne. The Board states that investigations of alternative systems of transport for the Bourke Street route (trolley-buses or motor buses) showed that the costs would be higher than for trams, and that the systems would be less convenient for the public.

France.—ELECTRIFICATION ON THE ORLEANS SYSTEM.—Among important works in hand on the Orleans railway system are the electrification of the line between Tours and Bordeaux (expected to be completed next year) and the installation of automatic colour-light signalling between Bretigny and Les Aubrais, states the *Railway Gazette*. Electrically operated traffic in 1936 amounted to 17,005,326 train-kilometres, or 30.20 per cent. of the total, apart from railcar traffic. Plans for electrification between Tours and Le Croisic are under consideration. On the Midi 18,874,446 train-kilometres, or 63.32 per cent. of the total apart from railcar traffic, were operated electrically. Stock in use on standard-gauge lines of the joint system included 2,807 steam locomotives, 577 electric locomotives, 5,606 passenger carriages, 90,958 goods vehicles and 107 containers.

Poland.—ANOTHER RAILWAY ELECTRIFICATION SCHEME.—The English Electric Co., Ltd., and the Metropolitan-Vickers Electrical Export Co., Ltd., with British Insulated Cables, Ltd., as principal sub-contractors, are completing the electrification of the Warsaw railway system, the first section of which was opened to electric traction at the end of last year. It is now reported that the companies are negotiating with the Polish Railway Ministry to undertake the electrification of railways in the Carpathian Mountains region.

South Shields.—TROLLEY-BUS SCHEME HELD UP.—The Town Council's plans for replacing the trams by trolley-buses are being held up and the new service from the Market Place to Ocean Road, which was expected to have been in use some time ago, will not come into operation for some weeks yet. The Council is still awaiting delivery of two trolley-buses and certain materials required for conversion purposes.

Sweden.—RAILWAY ELECTRIFICATION.—The electrification of the State Railway line between Oerebro and Svartaa station, a distance of 50 km., has just been completed.

Communications

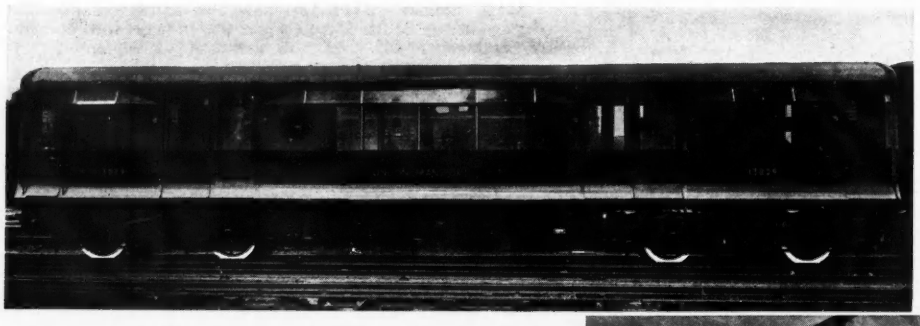
Germany.—LONG TELEVISION-TELEPHONE CABLE.—Last year Dr. Ohnesorge, State Secretary at the Ministry of Posts, announced television-telephone cable extensions from Berlin to Hamburg and from Leipzig to Munich. The Berlin correspondent of *The Times* now reports that part of the proposed extension to Munich has this week been put into service. The cable now extends from Berlin to Nuremberg, a distance of approximately 300 miles. It is to be used for direct relays of events and for regular television-telephone. Persons "seen" over the new cable are stated to be easily recognisable.

Great Britain.—LINK WITH IRAQ.—A telephone service with Iraq, which at the outset is being restricted to Baghdad, was inaugurated recently. The charge for calls from Great Britain and Northern Ireland is £4 7s. for three minutes (£5 3s. on Saturdays).

AUTOMATIC TELEPHONY.—An automatic telephone exchange has been opened recently at Widnes. The Mayor (Councillor P. Hanley) made the first call, speaking to the Lord Mayor of Manchester.

Improved London Transport Rolling Stock

THE London Passenger Transport Board is spending more than £1,700,000 on replacing pre-war rolling stock on the District and Metropolitan lines by improved types. The first four cars—a further 112 of the same type are being built—have just been received, and after tests they will be placed in service on the District line. An order for 401 cars of a similar type, but including trailer cars, has also been placed. At its works at Acton the Board is to modernise its post-war surface line trains to make them conform as nearly as possible to the new rolling stock now being introduced.



One of the new cars and a view of the interior

The cars just delivered are semi-permanently coupled into two-car units, the outer ends having automatic couplers. All four are motor cars, each being equipped with two traction motors and a driving cab. The traction control equipment operates four traction motors, *i.e.*, one control equipment per two-car unit.

The car bodies are a distinct departure from the Board's existing surface line cars. The doors are air-operated and are arranged for control by individual passengers by means of push-buttons at each side of the doorways both inside and outside the car, while the guard will be able to open all doors at the busy stations. During the normal hours and at outside stations the "passenger" control will be used, ensuring that no more doors than necessary are opened. Footboards have been eliminated. The bottom of the body panels has been flared out, giving a cleaner line. The lower part of the sliding doors is flared out also to follow the same contour as the body panels. The bogies of the cars are of all-welded construction.

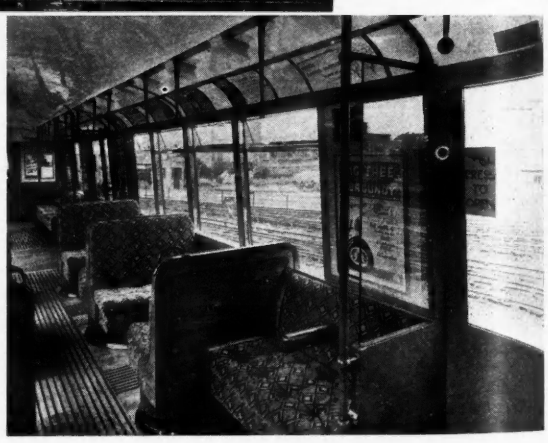
The lighting from parallel-burning lamps is obtained from the 50-V supply, a 5-kW motor-generator being fitted to each two-car unit. The lighting fittings are of a new design. They consist of fluted oblong shades housed in chromium-plated frames and situated in a line on either side of the centre roof sections.

Another interesting feature is that the metadyne used for controlling the traction motors is a self-ventilating machine. The air used for this machine is drawn from inside the car through double windscreens. This arrangement assists the ventilation and also makes a smoke barrier between the smoking and non-smoking parts of the car.

Whereas existing stock can be accelerated at from 1 to 1.2 m.p.h. per sec., the new cars are capable of 2 m.p.h. per sec. The braking speed is 3 m.p.h. per sec. By an ingenious arrangement of valves four different methods of braking can be employed, namely, light regeneration for checking the train, regeneration combined with electro-pneumatic braking, electro-pneumatic braking alone and automatic Westinghouse. A further feature which permits of high rates of braking is the use of a mercury switch retarder. By means of this switch—a form of fluid pendulum—high initial pressures are fed to the brake cylinders at the commencement of braking and the danger of wheel pick-up at lower speeds is avoided by automatic reduction.

Both starting and stopping are remarkably smooth.

The cars were supplied by the Gloucester Railway Carriage & Wagon Co., Ltd., which is building fifty-eight of this type, and the Birmingham Railway Carriage and Wagon Co., Ltd., an equal number. Sub-contractors for equipment included the General Electric Co., Ltd. (traction motors), Metropolitan-Vickers Electrical Co., Ltd. (traction gear and motor-generator sets), Westinghouse Brake & Signal Co., Ltd. (compressors and brake equipment), British Thomson-Houston Co., Ltd. (compressors), Young Accumulator Co., Ltd. (batteries), Benjamin Electric, Ltd. (lighting fittings), Equipment & Engineering Co., Ltd. (car heaters), Patent Lighting Co., Ltd. (multi-point connection boxes), and Clifford & Snell, Ltd. (driver's loudspeaker equipment).



Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Aberdeen.—September 14th. County Council. Electric wiring at the Tarland housing estate. A. H. L. MacKinnon, architect, 245, Union Street.

Australia.—MELBOURNE.—October 5th. Posts and Telegraphs, P.M.G. Department. Magneto and trembling bells and buzzers. (T. 19132/37.)* Generators and pole-changers. (T. 19183/37.)*

Birkenhead.—September 24th. Mersey Railway Co. Metallic and carbon filament lamps and fittings and electrical sundries. J. Shaw, general manager and secretary, Central Station.

September 11th. Corporation. Wiring of houses under the assisted wiring scheme. Borough electrical engineer, Craven Street, (deposit £1).

Brighton.—September 29th. Borough Council. Duplicate sets of air lift and high lift pumping plant, air compressors and electric motors, each capable of raising 1,500 gal. per hour, with auxiliary plant and other appurtenant works, in connection with the Colony for Mental Defectives, Laughton. Waterworks engineer, 12, Bond Street, Brighton (deposit £2 2s.).

Bristol.—September 14th. Corporation. E.h.v. and l.v. switchgear and l.v. feeder voltage regulators. (September 3rd.)

Cannock.—September 20th. U.D.C. Electrical wiring at the Littleworth senior boys' and girls' school. W. C. Speedy. clerk to the Council.

Cardiff.—September 13th. R.D.C. Electricity Department. Lamps. (August 27th.)

Chesterfield.—September 24th. R.D.C. Centrifugal pump, with electric motor and equipment, in connection with the Unstone sewerage and sewage disposal scheme. J. B. Wikeley, engineer to the Council, Public Assistance Offices (deposit £1 1s.).

Crayford (KENT).—September 27th. U.D.C. Two electrically driven sewage pumps, with motors, control panels, &c. F. A. N. Turner, engineer, Municipal Buildings (deposit £2 2s.).

Devon.—September 15th. Standing Joint Committee. Three years' supply of electric lamps, &c. A. J. Withycombe, clerk to the Committee, The Castle, Exeter.

Dundee.—September 15th. Corporation. Cable. (September 3rd.)

Durham.—County Education Committee. Electrical installation at the Easington Colliery school. County architect, 34, Old Elvet.

East Sussex.—September 16th. County Council. Six months' supply of electric lamps. Public assistance officer, West Street, Lewes.

Edinburgh.—September 27th. Electricity Department. Medium voltage switchgear for Portobello power station. (See this issue.)

Essex.—September 30th. County Council Education Committee. Equipment for the South-West Essex Technical College, Walthamstow. (August 27th.)

Fareham.—September 22nd. U.D.C. Three vertical-spindle, automatically controlled, centrifugal crude sewage pumps and electric motors at the Peel Common pumping station, two sets at the Crofton Manor Farm station, and three ejectors with air compressors and motors at the Hill Head station. Lemon and Blizard, Lansdowne House, Castle Lane, Southampton (deposit £3 3s.).

Finchley.—September 27th. Borough Council. Twelve months' supply of immersion heaters and circulators and aluminium utensils for use on electric cookers. (August 27th.)

Great Western Railway.—September 3rd. Telephones, telegraph instruments, &c., and electrical apparatus. (See this issue.)

Hendon.—September 17th. Corporation. Electrical installation at the Edgware junior and infants' school, High Road, Edgware. (September 3rd.)

Iran.—Ministry of Posts, Telegraphs and Telephones. Line materials, wet cells, dry batteries and accessories. (September 3rd.)

Jarrow-on-Tyne.—Town Council. Electrical work in 150 houses. J. S. Weir, borough engineer.

Lancashire.—September 25th. County Council. Electrical installations at the nurses' home extensions, Park Hospital, Davyhulme, and extensions to Biddulph Grange Orthopædic Hospital, Biddulph. Applications to S. Wilkinson, County architect, County Offices, Preston (deposit £2 each contract), by September 11th.

Littleborough.—September 13th. U.D.C. E.h.v. feeder cables. (August 27th.)

London.—KENSINGTON.—September 13th. Borough Council. Vehicle-actuated automatic traffic control signals at several road junctions. Borough surveyor, Town Hall, W.8.

BATTERSEA.—September 20th. Electricity Department. Coal. (See this issue.)

Middlesex.—September 30th. County Council. Bed and service lifts in the maternity block, Central Middlesex County Hospital, Willesden. (See this issue.)

September 27th. Automatic telephone cables at Shenley Hospital. (See this issue.)

October 4th. Bed lifts in blocks 11 and 12 at Chase Farm, Enfield. (See this issue.)

Newcastle-on-Tyne.—City Council. Electric lighting installation at fifty-four houses on the Fawdon Square estate. City architect, 18, Cloth Market.

New Zealand.—WELLINGTON.—October 14th. Post and Telegraph Department. P.i. telephone cable. (T. 18926/37.)*

October 26th. Public Works Department. 11,00-V p.i., l.c. circular conductors and outdoor type cable boxes. (T. 18932/37.)*

December 7th. Public Works Supplies and Tenders Committee. Two exciters, 420-V switchgear and control board. (T. 18922/37.)* Switchgear and reactors. (T. 18920/37.)*

Oldham.—September 20th. Borough Council. Transformers. (See this issue.)

Perth.—County Council. Electric lighting at the Bridge of Earn housing estate. County clerk, York Place.

Plymouth.—September 13th. Corporation. Cold chamber at the Mortuary, Vauxhall Street. (September 3rd.)

September 15th. Electric lighting, &c., at Camel's Head schools. J. Paton Watson, city engineer.

Skelton and Brotton.—September 14th. U.D.C. Electricity Department. Transformers. (August 27th.)

South Africa.—JOHANNESBURG.—September 18th. City Council. Welding plant. (T. 18766/37.)*

October 7th. Union Tender and Supplies Board. Motor generator set. (T.Y. 18770/37.)*

CAPE TOWN.—October 20th. City Council. 4,000 metal-clad combined switch and fuse boards for use in connection with domestic supplies. (T.Y. 18941/37.)*

DURBAN.—October 8th. Electrical Department. 6,600-V switchgear. (T. 19051/37.)*

OKAHANDJA.—October 30th. Municipal Electricity Undertaking. Power station and distribution network. (T. 19158/37.)*

PRETORIA.—October 7th. Public Works Department. Electric stoves, ranges, boiling tables, &c. (T. 19154/37.)*

Staffordshire.—September 23rd. Potteries Water Board. Two vertical well pumps and one horizontal surface pump (2 million gal, per 24 hr. each), with electrical controls, cables, pipework and valves. P. Wilkinson, Staffordshire Potteries Water Board, Albion Street, Hanley, Stoke-on-Trent (deposit £5).

Straits Settlements.—SINGAPORE.—October 15th. Municipality. Pumps and electrical equipment for the sewage works. (T.Y. 19172/37.)*

Sutherland.—September 25th. County Council. Electric lighting at Helmsdale housing estate. E. W. Brannen, architect, Dornoch.

Swansea.—October 4th. Borough Council. Four l.v. substation feeder panels. (September 3rd.)

Swinton and Pendlebury.—September 17th. Borough Council. Electric lighting at the new senior school, Cromwell Road, Pendlebury. Ralph, Son & Proud, architects, Leaders Buildings, King Street, Wigan.

Turriff.—September 13th. Town Council. Electric lighting at the Woodlands housing estate. Burgh surveyor.

Uruguay.—MONTEVIDEO.—October 13th. State Electricity Supply and Telephones Administration. Three automatic voltage regulators for Diesel engine alternator-transformer sets. (T.Y. 18726/37.)*

Wakefield.—September 17th. City Council. Electrical installations at the swimming baths, Sun Lane. (September 3rd.)

Walsall and West Bromwich.—September 17th. Walsall and West Bromwich (Barr Colony) Joint Board. Six months' supply of engineers' and electrical fittings. Clerk, Great Barr Park Colony.

West Hartlepool.—September 24th. Electricity Department. H.v. testing equipment. (See this issue.)

West Riding.—September 13th. Public Assistance Committee. Wiring for electric lighting and bells at the Todmorden Institution, and installation of automatic refrigerating plant at the Giggleswick Institution. P. O. Platts, West Riding architect, County Hall, Wakefield.

*Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Billingham-on-Tees.—U.D.C. Accepted. Installation of electricity in 109 houses on the Cowpen Lane estate (£622).—A. Anderson & Sons.

Blackpool.—Health Committee. Accepted. Electrical installations at offices: Medical section.—Nelson Bros.; Sanitary section.—A. S. Parkinson.

Darlington.—Town Council. Accepted. Boiler plant in connection with the generating station extensions (£116,000).—Babcock & Wilcox.

Glasgow.—Education Committee. Accepted. Electrical installation at the Carnwadric R.C. temporary school (£734).—Kennedy, Stark & Co.

Police Committee. Accepted. Electrical installation at the Temple police station (£140).—Woodward, Sons & Co.

Transport Committee. Accepted. L.c. cable.—Britannic Electric Cable & Construction Co.; Craigpark Electric Cable

Co., D.c. and a.c. switchgear for the Kinning Park sub-station (£6,100).—G.E.C.

London.—L.C.C.—Wiring and fittings for electric lighting, &c., in about 719 existing houses and flats, at Becontree (Dagenham area, No. 14 contract):

	£		£
Newman and Watson. Accepted	**6,869**	Read & Partners	8,099
Holliday & Son (Electrical) ...	6,907	G. E. Taylor & Co.	8,297
Electrical Installations ...	7,392	Ellis and Ward	8,442
Archibald Meckhonik	7,922	City Electrical Co.	8 981
Samuel Reed & Sons	8,074	Springvale Electrical Co. ...	10,812

Wiring and fittings for electric lighting, &c., in one block of dwellings in the Charlton Street area, St. Pancras:

	£		£
Archibald Meckhonik. Accepted ...	**496**	Ilford Electrical Co.	604
Samuel Reed & Sons	518	Pemberton and Sturgess (Great	
Pinching and Walton	532	Britain)	691
Read & Partners	540	Anderson, Angell & Co.	721
Buchanan and Curwen	569		

Wiring and fittings for electric lighting, power, clocks, fire alarms, radio and domestic call bells at No. 149, Upper Tulse Hill, Hostel for Able-Bodied Women:

	£		£
F. H. Wheeler & Co. Accepted ...	**379**	A. Meckhonik	570
Arthur Cozens	436	Gillham and Jones	570
A. J. Hewens & Sons	489	Carr Bros.	667
G. E. Taylor & Co.	548	Berkeley Electrical Engg. Co. ...	685
Francis Polden & Co.	565	Davis Myer & Co.	698

Wiring and fittings for electric lighting, &c., in the staff quarters at Dulwich, Wandsworth, Homerton, Camden Town and Clerkenwell fire stations:

	£		£
City Electrical Co. Accepted ...	**452**	A. Hawkins & Sons	539
Pinching and Walton	474	Jacob White & Co.	559
Pemberton and Sturgess (Great		G. E. Taylor & Co.	630
Britain)	491	Jones and Jennings	888
F. H. Wheeler & Co.	522	Springvale Electrical Co.	908

Wiring and fittings for automatic telephone system at the Goldie Leigh Hospital, Abbey Wood:

	£		£
A. Hawkins & Sons. Accepted ...	**675**	Standard Telephones and Cables	744
Read & Partners	680	Ericsson Telephones	756
T. Clarke & Co.	691	Automatic Telephone and Electric	
G. E. Taylor & Co.	706	Co.	783
Holliday & Son (Electrical) ...	716	Reliance Telephone Co.	790
S. Reed & Sons	729		

Wiring and fittings for electric lighting in nurses' homes Nos. 1 and 2, lecture room, chapel, &c., at the Highgate Hospital:

	£		£
Read and Partners. Accepted ...	**966**	Davis Myer & Co.	1,063
Gillham and Jones	983	F. G. Edey & Co.	1,084
Archibald Meckhonik	985	W. H. Gaze & Sons	1,103
Francis Polden & Co.	1,023	A. J. Hewens & Sons	1,310
W. Steward & Co.	1,025	Collins Electrical	1,995

Installation of electric lighting at the Gipsy Road School, Norwood:

	£		£
F. H. Wheeler & Co. Accepted ..	**1,247**	Francis Polden & Co.	1,768
Holliday & Son (Electrical) ...	1,605	Ilford Electrical Co.	1,804
Arthur Cozens	1,661	Archibald Meckhonik	1 874
C. J. Ferguson & Sons	1,741		

Wiring and fittings for electric lighting, &c., at Stillness Road, Lewisham, W.:

	£		£
Holliday & Son (Electrical). Accepted	**1,307**	Bower Engg. Works (Electrical and General)	1,566
Warren Smith & Co.	1,347	G. E. Taylor & Co.	1,575
Archibald Meckhonik	1,504	Berkeley Engg. Co.	1.608
Read & Partners	1,522	Jones and Jennings	1,902
Samuel Reed & Sons	1,543		

Forthcoming Events

Institute of Marine Engineers.—Tuesday, September 14th. The Minories, London, E.C.3. 6 p.m. Presidential address by Mr. S. J. Pigott.

Engineering and Marine Exhibition.—Thursday, September 16th, to Saturday, October 2nd. Olympia, London.

Association of Mining Electrical Engineers (*South Wales Branch*).—Saturday, September 18th. 3 p.m. Visit to the pumping station of the Severn Tunnel at Sudbrook, near Portskewett.

Association of Supervising Electrical Engineers.—Saturday, September 18th. Visit to the Engineering and Marine Exhibition, Olympia.

Junior Institution of Engineers.—Saturday, September 18th. Visit to the Engineering and Marine Exhibition, Olympia. Wednesday, September 22nd. Visit to the new headquarters of the London Fire Brigade, Albert Embankment. Saturday, September 25th. Visit to the Mogden purification works, West Middlesex drainage, Isleworth.

Institution of Electrical Engineers.—Thursday, September 30th. Visit to the Engineering and Marine Exhibition, Olympia.

National Smoke Abatement Society.—Thursday, September 30th, to Saturday, October 2nd. Leeds. Annual conference.

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

Window-cleaning machine.

NU-WAY conduit boxes.

WILBROFEN pressure switches (British agents).

Earth drills and derricks mounted on tractors or lorries for line erection.

COMPACTUM switches.

Miniature automatic cut-outs combining fuse and cut-out.

Address of A.R.I.C., Ltd.

Readers should enclose stamped addressed envelopes when making their inquiries.

Notes

Electricity and Compressed Air in Mines

Nearly half the coal mined in 1935 (228,000 tons) was cut by machines, and of this proportion about 71 per cent. was cut by 4,635 electric coal-cutting machines. In 1932 the latter numbered 3,970, so that the increase in three years was 17 per cent. During the same period the number of compressed-air cutters declined from 3,167 to 2,837. *Compressed Air Engineering* "insists" that the use of electrical power at the coal face should be forbidden. From the figures given above, it would seem that insistence is likely to be poorly rewarded in this case.

E.A.W. Activities

The coming autumn promises to be an enjoyable and busy time for the London Branch of the Electrical Association for Women. The programme just issued includes a number of interesting visits and lectures and discussions on kitchen problems, home lighting, rural tariffs, &c. At the business hour luncheon at the Prince's Restaurant, Piccadilly, on October 12th, Mr. F. R. Yerbury, managing director of the Building Centre, will speak on "The kind of house that a woman should have." Subjects of lectures and demonstrations arranged for the Demonstrators' Circle include: "The film in demonstration" and "How the demonstrator can help the 'Better Light—Better Sight' campaign." Visits to the Barking power station and the Ediswan works have been planned for the Teachers' Circle.

The desirability of electrical education for women was emphasised by Bailie Mrs. Roberts, convener of the Glasgow Corporation Electricity Committee, at a dinner given by the Electrical Association for Women at Glasgow on August 30th in connection with a five-day course of electrical housecraft. Tradition died hard, she said, and unfortunately women did not appreciate that the age of tradition was the age of toil. For a number of years she said she had been urging the Glasgow Electricity Department to supply washing machines on hire-purchase. She had now succeeded, and housewives would soon be able to have them for 10s. a month. Earlier in the day Mr. H. W. Hime, of the Lighting Service Bureau, gave an address on "Illumination Fundamentals," while Mr. A. M. Estcourt spoke of electricity tariffs and their application to consumers' demands. During a visit to the Royal Technical College on the following day a lecture demonstration was given by Professor S. Parker Smith.

Training in Radio

The new term at Chelmsford College, the Marconi school of radio communication, starts next Monday. Private students are accepted for training if they have graduated elsewhere or have passed an entrance examination showing that they have reached the standard in theory required in connection with the advanced course which the school provides. Two sessions are held each year—from September to January and from March to July—each consisting of an experimental and a lecture course. Further particulars are obtainable from Marconi's Wireless Telegraph Co., Ltd.

British Institutes to Visit America

The Councils of the Institute of Metals and the Iron and Steel Institute have accepted an invitation from the American Institute of Mining and Metallurgical Engineers and the American Iron and Steel Institute to hold a joint autumn meeting in the United States next year. The meeting will be held in New York and will be followed by visits to laboratories, works and places of general interest. It is proposed that the meeting shall open in New York on October 3rd, 1938, and the main programme will start about three weeks from that date.

Educational

Enrolment for evening classes at Battersea Polytechnic will commence on September 16th.

(See our classified advertisements.)

An E.D.A. Appointment

A notice appears in our advertisement pages to-day from the British Electrical Development Association inviting applications from electric power engineers to undertake development work for the Association. The salary is £600 to £700.

Appointments Vacant

Visiting teacher at the School of Engineering and Navigation, Poplar, for the L.C.C.

Electrical and heating engineer in the Office of Public Works, I.F.S.

Assistant distribution engineer for the Mersey Power Co., Ltd.

Executive engineer in the Posts and Telegraphs Department for the Sudan Government.

Temporary mechanical and electrical engineering assistants in the drawing office of the Air Ministry and at R.A.F. aerodromes.

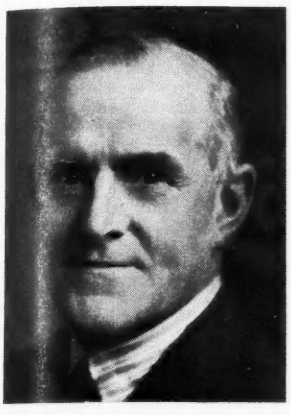
Temporary mains assistant in the drawing office of the Air Ministry.

Accounts clerk for the Gillingham Electricity Department.

(See our classified advertisements.)

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements



Mr. R. F. Smith

Mr. R. F. Smith, deputy manager of the Glasgow Corporation Transport Department, has been appointed general manager of the Department in succession to Mr. J. N. Wilson, who is retiring in November next. The salary is £1,500, rising to £2,000, per annum. Mr. Smith received the groundwork of his transport training under the late Mr. J. Young, pioneer of Glasgow's transport system. He gained experience in every section of the undertaking, and during his period of service he has held the positions of cashier and chief accountant. Upon the retirement of Mr. Dalrymple he was appointed traffic superintendent and followed Mr. Wilson as deputy general manager on the retirement of Mr. Mackinnon in 1936.

As a result of the resignation of **Mr. Dunkley,** operation superintendent for the South-West England and South Wales Grid Area, there has been a reorganisation, and the following changes have been made: **Mr. G. W. Maxfield** becomes senior assistant operation engineer; **Mr. P. W. Cash,** day control engineer; **Mr. E. M. Nuttall,** control engineer; and **Mr. R. C. Golding,** statistics engineer.

The wedding took place in Newcastle on August 21st of Miss May Dickson and **Mr. A. K. Wardroper,** M.B.E. Mr. Wardroper is the North-East Coast representative of the London Electric Wire Co. and Smiths, Ltd., Frederick Smith & Co., and the Liverpool Electric Cable Co., Ltd.

Mr. W. D. Sutcliffe, A.M.I.E.E., assistant superintendent of the Testing Department of the Lancashire Electric Power Co., was married to Miss Mavis Charlton at Farnworth on September 6th.

Mr. S. F. Davies, A.M.I.Mech.E., formerly chief engineer of Edifis, Ltd., and associated companies, has been appointed chief engineer of Grosvenor House, Park Lane, in place of Mr. R. A. P. Morgan, who has resigned. Mr. Davies was chief engineer of the company which built Grosvenor House nine years ago, when he was responsible for all the engineering work in the hotel. He is a member of the Association of Supervising Electrical Engineers. The new post of clerk of works has been created at Grosvenor House, and **Mr. R. E. Woolgar,** formerly of the Building Department of Edifis, Ltd., has been appointed to this position.

Col. F. A. Neill, D.S.O., T.D., chairman of James Neill & Co. (Sheffield), Ltd., is the Master Cutler Elect of the Cutlers' Company in Hallamshire in the County of York. Col. Neill, who is the eldest surviving son of the late Mr. J. Neill, founder of James Neill & Co., was educated at Wrekin College before going to Germany for two years to complete his education and obtain business experience. He entered the business of James Neill & Co. in 1910 and was appointed a director of the company in 1916. Upon the death of his father in 1930 he became chairman and managing director. He has travelled extensively on the company's business, visiting practically all the European markets. Col. Neill has been a member of the Sheffield District Committee of the F.B.I. since 1927, and for the past six years has been one of Sheffield's representatives on the Empire and other committees in London, being elected to the Grand Council Executive in 1933. Col. Neill was appointed to a commission in the 49th West Riding Divisional Royal Engineers and served in France from 1915 until he was wounded in 1918. He was awarded the D.S.O. in 1917, the Croix de Guerre in 1918 and was mentioned in dispatches on four occasions. After the war he took command of the 49th West Riding Divisional Royal Engineers, and on completing his period of command in 1930 he was promoted Colonel.

Col. F. A. Neill

Mr. C. L. Gray, formerly dealers' sales manager for the Lightfoot Refrigeration Co., Ltd., has been appointed managing director of Under-wood (Manchester), Ltd., and will assume his responsibilities early this month.

Mr. C. L. Gray

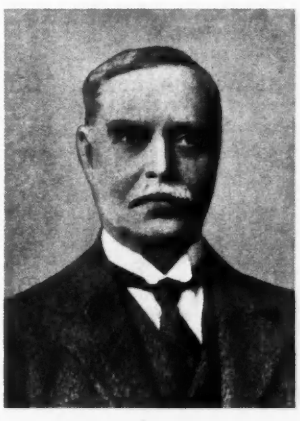
Mr. W. J. H. Penman, general manager of the Lancaster Corporation Transport Department, has been appointed manager of the Darlington Corporation transport undertaking. Mr. Penman received his training under Mr. R. Stuart Pilcher (now general manager of the Manchester Transport Department) in the Edinburgh Corporation Transport Department, and was connected with the change-over from cable trams to electric traction in Edinburgh. In 1928, at the request of the Perth Town Council, he was lent to that authority by the Edinburgh Corporation to act in an advisory capacity to the Perth Tramways Department, and on the position becoming vacant in September, 1928, he was appointed manager at Perth. In 1934 he was appointed general manager at Lancaster, and during his period of service there has reorganised the whole of the Transport Department.

Sir William Bragg has been elected president of the Royal Societies' Club to fill the vacancy caused by the death of Sir James Barrie.

Mr. H. J. Bullard, Grad. I.E.E., electrical inspector to the Surrey County Council, has resigned to take up a similar post with the Middlesex County Council.

Obituary

Professor Magnus Maclean.—We regret to record the death, which occurred on September 2nd at his residence, 108, University Avenue, Glasgow, at the age of eighty years, of Professor Magnus Maclean, M.A., D.Sc., LL.D., Emeritus Professor of Electrical Engineering at the Royal Technical College, Glasgow. He occupied his distinguished position in the chair at the college from 1899 until his retirement under the superannuation scheme in April, 1923, when he was succeeded by Dr. Stanley Parker Smith, until then assistant professor in the Electrical Department of the City and Guilds (Engineering) College in London. An account of Professor Magnus Maclean's career appeared in the ELECTRICAL REVIEW at the time (April 20th, 1923, together with a portrait—we are uncertain whether he was subsequently photographed). He was born in Glendale, Skye, in 1857, and first worked on his father's croft, but he soon turned to study and to teaching. It was while he was working to take the M.A. degree that he won a Thomson Experimental Scholarship in the Physical Laboratory at Glasgow University. Lord Kelvin was so impressed that before he had finished his curriculum for his degree he appointed him his chief assistant. The association with Kelvin lasted for many years, both in experimental and research work and as joint-author of various papers. Later Maclean gained the degree of D.Sc., and was elected fellow of the Royal Society of Edinburgh. After taking up his appointment at the Technical College in 1899 he became first Celtic Lecturer in the University and delivered a series of lectures on the "Literature of the Celts" and the "Literature of the Highlands." Many papers were read by him before the Royal Society, the Royal Society of Edinburgh, the Institution of Electrical Engineers and the British Association. In 1918 he delivered the Kelvin Lecture before the I.E.E. on "Kelvin as a Teacher." He was the author of a number of important electrical books, including "Electricity and its Practical



The late Professor M. Maclean

Applications," "Modern Electrical Practice," and "Modern Electrical Engineering." One of his lectures which created great interest dealt with the economic possibilities presented by a potential half-million horse-power of hydro-electric energy in the Scottish Highlands. His knowledge of most modern developments of electrical engineering was great and he had much experience in testing submarine cables and in the adjustment of the instruments for the transmission of messages. Professor Maclean was an examiner in electricity at the Universities and in 1919 Glasgow University honoured him with the degree of LL.D. We may add that during his 25 years in the chair of Electrical Engineering in the Technical College he extended the scope and efficiency of the department and maintained it on a thoroughly up-to-date footing. Not only was the academic standard of training kept at the highest pitch, but it was also brought into intimate association with practical developments in the industrial world. He was an enthusiastic supporter of all movements which led employers to give encouragement and recognition to technical training, and many important schemes were brought into operation during his occupancy of the chair. He took a leading part in the work of many scientific, literary, and charitable societies in the West of Scotland. On the occasion of his retirement from the chair of Electrical Engineering at the Royal Technical College he was honoured by his fellow citizens at a function presided over by Lord Blythswood. Until a short time ago Professor Maclean was chairman of the Craigpark Electric Cable Co. He leaves a son and two daughters; Mrs. Maclean died some years ago.

Mr. W. E. Ireland.—The death occurred recently, at the age of sixty-three, of Mr. W. E. Ireland, O.B.E., who retired from the position of rolling stock engineer to the London County Council Tramways in 1932. Mr. Ireland entered the service of the L.C.C. as technical assistant in 1904 after a period on the engineering staff of the London United Tramways Co. He became assistant rolling stock superintendent in 1906 and superintendent two years later. He was appointed rolling stock engineer in 1919 and retired from that position on account of ill-health.

Mr. J. J. MacDonald.—The death occurred at Worthing on September 4th of Mr. J. J. MacDonald, M.E.I.C., A.M.Inst.C.E., late of Halifax, N.S., Canada, and chief engineer of Sir Alexander Gibb & Partners.

Mr. George Cooke, of Wilmslow, Cheshire, whose death is announced at the age of sixty-four years, had been in business in the town as an electrical engineer for the past thirty-two years. He was at one time mains superintendent at Market Drayton for Edmundsons Electricity Corporation.

New Books

Fundamentals of Engineering Electronics. By WILLIAM G. DOW. Pp. 604; figs. 200. London: Chapman & Hall, Ltd. Price 25s.

This book is essentially one for the serious student who has already some acquaintance with the principles underlying the operation of electronic tube devices. It is divided into two distinct parts, the first dealing with "Electrons" and the second with "Electrons, Atoms and Radiation." The treatment is largely mathematical, particularly in the earlier chapters, which are devoted to potential distribution diagrams, the electrostatic field of a triode and electron ballistics.

Chapter 4 deals with cathode rays and discusses theoretically such subjects as the production and focusing of the electron beam, its voltage and magnetic sensitivity and its photographic and visual effects. There follows an interesting chapter on triodes, tetrodes and pentodes, followed by a section dealing with thermionic cathodes and their properties. The remaining portion of part one discusses circuit details, amplifiers and oscillators employing various types of electron tubes.

For the second part more than a little knowledge of gaseous discharge devices is necessary in order that one may extract the maximum benefit from the author's treatment of a difficult subject. In chapter 16 deductions from the energy level diagram of the mercury atom relating to the colour of the resultant radiation are not borne out in practice and there are one or two minor references to fluorescence which seem inadequate in such an advanced work. The subject of chapter 19 is electric arcs and glow discharges, and some interesting data on plasmas is given in this and the succeeding chapters.

Although Mr. Dow's work can be recommended as a comprehensive and up-to-date study of the operating principles of electronic devices and circuits, it would have perhaps appealed to a wider public if, in the treatment of several of the sections, more space had been devoted to matter of an introductory nature. The reader finds himself involved in advanced treatment of the subject without having received sufficient helpful preparation of a more elementary nature. An excellent bibliography is included and is preceded by some useful tables of physical constants of value to the engineer and physicist.

An Outline of Atomic Physics. Pp. 414; figs. London: Chapman & Hall, Ltd. Price 18s. 6d.

This is the second edition of a book first published in 1933 which was based upon a course of lectures given by the physics staff of the University of Pittsburgh to students who had completed a year of physics, but whose future work was expected to be in other fields of science. The mathematical treatment is generally simple and in most cases its working out can be taken for granted. The many developments recorded since the original work appeared have called for considerable expansion of and modifications in the text, which includes a new chapter on nuclear structure. For those who desire to have more than a superficial knowledge of the present stage of progress in this constantly expanding field, the book is to be recommended.

Shorter Notices

"Wireless Servicing Manual," by W. T. Cocking. (Third edition). Pp. 241; figs. London: Iliffe & Sons, Ltd. Price 5s.

"Radio Servicing Simplified." (Sixth edition). Pp. 150; fig. London: The Automatic Coil Winder & Electrical Equipment Co. Price 2s. 6d.

"Television Engineering," by J. C. Wilson. Pp. 492; figs. 276. Price 30s. "New British Industries in the Twentieth Century," by A. Plummer. Pp. 396; figs. Price 15s. London: Sir Isaac Pitman & Sons.

"Wages and Labour Conditions in British Engineering," by M. L. Yates. Pp. 172. London: McDonald & Evans. Price 6s.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

G. R. Croskell, Ltd.—Private company. Registered August 30th. Capital, £2,500. Objects: To carry on the business of electrical and mechanical engineers and contractors, merchants and dealers in insulated electrical conductors, cables, wires, cords, dynamos, &c. The directors are: G. R. Croskell (permanent governing director), 301, Wigan Lane, Wigan, and Mrs. M. A. P. Croskell, 301, Wigan Lane, Wigan. Secretary: M. Chisnall. Registered office: 20, Rodney Street, Wigan.

Bedford Refrigeration Co., Ltd.—Private company. Registered September 1st. Capital, £2,000. Objects: To design, manufacture, install and generally deal in freezing and cold storage rooms, stores and chambers, ice safes, refrigerators, freezing machines, and ice makers, &c. The directors are: C. H. Elford, 8, Park Avenue, Bedford, and G. B. Baker, 36, Irwin Road, Bedford. Solicitor: A. S. Coldham, 3 and 5, Cherrydown Avenue, Chingford.

C. E. E. Co., Ltd.—Private company. Registered August 31st. Capital, £1.000. Objects: To carry on the business of industrial electrical equipment manufacturers and factors, electrical wiring contractors, vendors of electrical and household goods, wireless apparatus, &c. The directors are: A. J. Colton, 54, Cromwell Avenue, Cheshunt, and S. R. Hugkulstone, 9, Market Street, Paddington, W.2. Registered office: 8, Paternoster Row E.C.4.

Transformers & Welders, Ltd.—Private company. Registered August 31st. Capital, £10,000 in 8.000 6 per cent. participating preferred ordinary shares of £1 each and 40.000 ordinary shares of 1s. each. Objects: To carry on the business of manufacturers of and dealers in electric transformers, electric welding plant, electrodes and all component parts thereof, and electrical appliances, apparatus and equipment of all kinds, &c. The directors are: J. Connelly, 14, Highlands Heath, Old Portsmouth Road, Putney, S.W.15, and A. S. McHugh, "Mullabrach," Ashley Road, Walton-on-Thames (directors of Britannic Electric Cable & Construction Co., Ltd.). Qualification: 20 shares. Secretary: J. B. Titchener, 18, Claremont Road, Ealing, W.13. Registered office: 11, Southampton Row, W.C.

Radio Instruments, Ltd.—Private company. Registered August 27th. Capital, £100. Objects: To carry on the business of manufacturers, exporters and importers of and dealers in sound and vision producing, transmitting, reproducing and amplifying instruments, radio, television, telephonic and telegraph apparatus, &c. The subscribers are: J. Joseph, The Beacon, Purley, Surrey, and E. J. Fearn, 47, Clarendon Way, Chislehurst, Kent. Secretary: James Bell, C.A., 46, Victoria Street, S.W.1.

Returns of Electrical Companies

Howard Electrical Co., Ltd.—Edward H. Palmer, of General Buildings, Bridlesmith Gate, Nottingham, ceased to act as receiver and/or manager on August 31st, 1937.

Caffin & Co., Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, fixed plant and machinery and fixtures, dated August 26th, 1937, to secure all moneys due or to become due from the company to Lloyds Bank, Ltd.

Automatic Electrical & Mechanical Controls, Ltd.—Particulars filed of receiver's notes to secure £500 authorised July 28th, 1937, charged on the company's undertaking and property, the whole amount being now issued.

Direct West India Cable Co., Ltd.—Capital, £200,000 in £1 shares. Return dated May 18th, 1937. All shares taken up. £200,000 paid. Mortgages and charges nil.

Halifax & Bermudas Cable Co., Ltd.—Capital, £50,000 in £5 shares. Return dated May 18th, 1937. All shares taken up. £50,000 considered as paid. Mortgages and charges nil.

Shoreham & District Electric Lighting & Power Co., Ltd.—Capital, £125,000 in £1 shares. Return dated July 6th, 1937. 100,000 shares taken up. £93,500 paid, £6,500 considered as paid. Mortgages and charges nil.

Bude Electric Supply Co., Ltd.—Capital, £30,000 in £1 shares. Return dated June 1st, 1937. All shares taken up. £30,000 paid. Mortgages and charges: £2,500.

Horace Grensted, Ltd.—Capital, £2,000 in £1 shares. Return dated June 17th, 1937. 1,500 shares taken up. £1,000 paid, £500 considered as paid. Mortgages and charges nil.

J. H. Blount & Co., Ltd.—The nominal capital has been increased by the addition of £1,200 in £1 ordinary shares beyond the registered capital of £800.

M. W. Woods, Ltd.—The nominal capital has been increased by the addition of £75,000 beyond the registered capital of £25,000. The additional capital is divided into 35,000 5½ per cent. redeemable cumulative first preference and 20,000 6 per cent. cumulative 2nd preference shares of £1 each and 200,000 ordinary shares of 2s. each.

General Signal and Time Systems, Ltd.—The nominal capital has been increased by the addition of £2,000 in £1 ordinary shares beyond the registered capital of £2,000.

Wantage Electric Supply Co., Ltd.—Capital, £6,000 in 600 preference shares of £5 and 3,000 ordinary shares of £1. Return dated May 4th, 1937. 240 preference and 2,202 ordinary shares taken up. £3,402 paid. Mortgages and charges nil.

K. & B. Radio Serivces, Ltd.—Capital, £1,000 in £1 shares. Return dated July 16th, 1937. 652 shares taken up. £652 paid. Mortgages and charges nil.

Painter & Madew, Ltd.—Capital, £2,000 in £1 shares. Return dated July 2nd, 1937. 1,445 shares taken up. £1,085 paid, £360 considered as paid. Mortgages and charges nil.

C. J. Bartley & Co., Ltd.—Capital, £1,000 in £1 shares. Return dated June 15th, 1937. 990 shares taken up. £240 paid, £750 considered as paid. Mortgages and charges nil.

Lancashire Dynamo & Crypto, Ltd.—Satisfaction in full on June 20th, 1937, of trust deeds dated March 4th, 1907, June 24th, 1907, and July 19th, 1927, and registered November 13th, 1907, and July 25th, 1927, securing £75,000 debentures.

S.D. Mouldings, Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated August 26th, 1937, to secure £274. Holders: S. Herman, D. Herman and I. Herman, all of Squirrel Tail Works, Knightland Road, E.5.

E. F. Turner & Son (Oxford), Ltd.—Debenture, charged on the company's property, including uncalled capital, dated August 26th, 1937, to secure £300. Holder: Mrs. P. Benger, "Denton," Pathlow, Stratford-on-Avon.

City Notes

The City of London Electric Lighting Co., Ltd.—An extraordinary meeting was held on September 3rd to consider a resolution approving an agreement between the company, the County of London Electric Supply Co., Ltd., the South Metropolitan Electric Light & Power Co., Ltd., and the South London Electric Supply Corporation, Ltd. Mr. P. D. Tuckett (chairman), who presided, said that the agreement did not constitute an amalgamation between the companies, and it did not mean that the City of London Co. was being absorbed by the County Co. Both companies would remain unaffected as to their capital and legal structure, and there would be no interference with the rights of stockholders. The agreement would enable bulk supplies to be given by the County Co. to the City Co., and vice versa, and it would make possible in the future a much closer co-operation than had existed in the past. Economies and other advantages must arise from this co-operation, and the company's customers would benefit therefrom. The agreement would be operated through a joint management committee upon which the executive heads of the City and County companies would sit, and by the appointment of one director of each company to the board of the other. The agreement, while it could not in any way be regarded as a final settlement of the problems confronting the industry in London, did make an important contribution towards that settlement. Further steps would be taken. For example, their directors and those of the London Associated Electricity Undertakings, had under consideration the need for dealing with the overlapping powers which the two companies possessed in the City of London, and he hoped it would be possible to make an announcement on this subject at no distant date. A resolution approving the agreement was carried.

Strand Electric Holdings, Ltd., held its annual meeting on September 6th when Mr. F. L. Blow (chairman), who presided, said that the extension of the works at Gunnersbury twelve months ago was already inadequate and negotiations had taken place to acquire on lease a suitable modern works. This would give the company the room required and at the same time help to solve the question of West End premises by transferring some of the work now carried on there to the new building. The business of the supply of lighting equipment and control gear required a staff employed off the premises of the company in London and the provinces, and provided a constant run of work for the workshops. In addition, equipment for general trade purposes was manufactured for customers in all parts of the Empire. The new factory would make it possible for the sales staff to increase its efforts and it was also hoped to obtain a share of Government contracts. Every department was fully occupied, including the Strand and Interchangeable Signs, Ltd., a subsidiary engaged in the installation of neon and other signs. As another step forward arrangements had been made for a branch in Manchester to serve the northern areas.

Hoover, Ltd., has declared an interim dividend of 5 per cent. actual on the ordinary shares.

Stothert & Pitt, Ltd., are paying an ordinary dividend of 10 per cent., less tax, and a cash bonus of 2½ per cent. for the year ended June 30th. For the previous year the dividend was 7½ per cent. on £191,585 ordinary shares. The capital has since been increased to £250,000 by the issue of 58,415 ordinary shares of £1, and these new shares rank for the present distribution.

The British Power & Light Corporation has announced an interim dividend of 2 per cent. on the £2,030,000 ordinary stock. The previous year's interim was the same but was on £1,690,616 ordinary stock.

Edmundsons Electricity Corporation, Ltd., reports that the results of the operations of its group of companies during August, as compared with the corresponding month of 1936, show an increase of 16 per cent. in kWh sold.

Walsall Conduits, Ltd., has declared an interim dividend of 20 per cent., actual, less tax, on the ordinary shares. The company was registered in November, 1936, and a dividend of 6¼ per cent. was paid for the period to December 31st, 1936.

The Globe Telegraph & Trust Co. is paying a quarterly dividend of 2s. 6d., net, per £10 share. This is equivalent to 5 per cent. per annum, tax free, and compares with 2s. per share, or at the rate of 4 per cent. per annum, last year.

The British Columbia Power Co. has announced a dividend of 50 cents on the "A" shares for the quarter ending September 30th (against 40 cents a year ago and 45 cents for the preceding quarter).

Ward & Goldstone, Ltd., have declared the usual interim dividend on the cumulative preference shares at the rate of 7 per cent. per annum.

Worthington-Simpson, Ltd., have announced the half-yearly dividend on the 6 per cent. cumulative preference shares.

Stocks and Shares

TUESDAY EVENING.

FOREIGN politics dominate the position in most of the Stock Exchange markets. Instead of the atmosphere becoming clearer in the Far East, the latest developments suggest that matters are still more serious than they were before, while in the Mediterranean the operations of irresponsible—if they are such—submarines, are intensifying the likelihood of fresh trouble arising in Europe. It is remarkable, all things considered, that Stock Exchange markets and prices stand up as well as they do against the number of warring elements which abound at the present time. New York and the United States are troubled with threats of railway and other strikes. The Argentine Presidential election has not been carried through without bloodshed. Look where one will, the political aspects are charged with uncertainty. No one connected with Stock Exchange markets can have any desire to be pessimistic, or to magnify possibilities of trouble. Against these factors of disturbance may be set the constant evidence of improvement in trade in this country and, also, in the United States, in which latter country it is said, however, that industry gives signs of slowing-down after its six months of acceleration. In the Old Country, everything points to the continuance of active domestic trade, the only fly in the ointment being the hint, given in many directions nowadays, of the increasing costs which affect production, distribution and other branches of trade.

The Trend of Investment

Examination of price lists of gilt-edged securities will show that in a surprising number of cases securities standing nearly in the front rank of investment give a yield, at the present time, higher than that obtainable from the ordinary shares of sound industrial companies. The investor is prepared, these figures testify, to accept a very modest return on his money for the moment, hoping, of course, that the increase in national industry will reimburse him through improvement in the dividends on the ordinary shares which he buys. The tendency is to look so far ahead that people will buy shares to-day with the announced intention of holding them for another six, nine or more months, within which time they anticipate such an increase in the previously-paid dividends as will enable them either to sell at a profit, or receive a higher yield than that now apparent. This financial trend of the day is worth noting as an answer to inquiries as to why the return on ordinary shares should be so meagre, while that on "money-stocks" gradually increases as their prices sag for want of support.

British Government and Mexico

Holders of Mexican "insecurities" will derive cold comfort from the reply given this week by His Majesty's Government to an appeal made to the Government by Stock Exchange dealers in the Foreign Market for intervention on behalf of British holders of Mexican bonds. The Government reply is couched in polite and sympathetic terms, but says quite defi-

nitely that the Government sees no particular object in intervening at the present time, and adds that to do so might even aggravate the difficulties which at present exist.

This answer is concerned with the case of British holders of Mexican Government bonds. It applies with equal force to proprietors of the bonds and shares of Mexican utility companies, some of whom must have abandoned, by this time, any but the most slender hope of getting back anything out of the position in which their companies now appear to be involved.

Cables and Wireless

Mention was made here last week of the way in which the price of Globe Telegraph and Trust ordinary stock has lately gone ahead against the general tide of prices. Reasons suggested for the advance were improvement in the position and prospects of Cable and Wireless, in which the Globe company is mainly interested, and official sanction for optimism regarding future dividends. This last consideration has been fortified by the declaration of an increase from 1 to 1¼ per cent, tax free, in this year's first quarterly dividend. The price of the £10 units responded very readily to the news with a jump of 5s.; later, a partial reaction left the quotation at 16⅞, ex-dividend, or 22s. 6d. higher than it was about six weeks ago. Last year's total payment of 5½ per cent. was made up of three interim dividends of 1 per cent. each and a final of 2½ per cent., all paid free of tax. Dullness in the prices of Cable and Wireless stocks is due in part to the general tendency of the markets and partly to sales on account of people obliged to provide money in order to meet differences incurred in other and more speculative markets.

English Electric

English Electric ordinary have lately been among the few industrial shares to attract bullish interest of a practical kind. The shares have been bought in numbers sufficient to counter the general downward drag of prices, and slightly to advance the quotation over the past week or two. The buying has resulted, it is said, from anticipation of a quite substantial dividend in respect of the current year. The company's year does not end until December, and the accounts are commonly presented two months later. Nevertheless, there seem to be grounds for the cheerful view which some people are taking of the prospects. Last year saw a big recovery in earnings; these were largely absorbed, however, by the necessity for paying off preference dividend arrears. But for these encumbrances, profits would have been equal to about 11 per cent. on the ordinary capital, after allowance for normal preference charges.

Dividend Prospects

At the last meeting of the English Electric, the chairman said that business had been broadening throughout the year, and that the company entered 1937 with the largest order-book in its history. It is thought that shareholders can, for these reasons, feel comfortably assured this year of their long-awaited dividend. Talk of a 20 per cent. distribution seems somewhat optimistic, although earnings might, of course, reach that level. Cautious prophets are mindful of such difficulties as may be presented by increase of costs and the prices of materials. Owing to the company's important export trade, international conditions may also loom fairly large.

Walsall Conduits Dividend

The interim dividend of 20 per cent. declared on Walsall Conduits ordinary made a good market impression: conditions were, however, too heavy for satisfaction to give anything more than a slight upward turn to the price of the shares. These stand at 29s., ex-dividend, as compared with the price of 32s. 6d. at which they were offered, rather less than a year ago, to the public. The first report was issued in March, when a small actual dividend, at the rate of approximately 50 per cent. per annum, was paid out of profits which were above the prospectus estimate and equivalent to more than 70 per cent. on the ordinary shares. Given normal trading conditions, presumption seems to be on safe ground in predicting a final dividend to make not less than 50 per cent. for the current year in which event, the yield on the 4s. shares at to-day's price would be upwards of 7 per cent.

Miscellaneous Matters

Traction stocks remain out of favour: British Electric Traction deferred continued downwards, with a drop of 50 to 1225, as have Tillings, to 57s. 9d. ex dividend. Home Railway stocks threw off none of their dullness on the Union's acceptance of the labour award, although some apprehension on this score had previously existed. London Transport "C" stock eased off to 81½. Radio shares have fluctuated but slightly. E. K. Coles are 16s., Pye deferred 14s. 6d., and "Emmies" 21s. 9d. Wall Street has turned pessimistic on questions both international and domestic: a sharp break in prices left most of the popular stocks substantially lower. British Columbia Power issues were steadied by news of an increase in the third quarterly dividend on the "A" shares: the latter are quoted at 36, and the "B" shares at 7⅝. Electricity supply shares are quoted in some cases ex the interim dividends: the deductions were easily regained. Iron and steel shares have eased off in sympathy with the prevailing disposition. What few changes have taken place in the electrical equipment section are downward, with none, however, of any consequence.

Share List of Electrical Companies

	Nom.	Dividend. Previous.	Dividend. Last.	Price Sept. 7.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	67/6xd.	+1/-	4 9 0
City of London	1	7½	7½	34/6	—	4 7 0
Clyde Valley	1	7	8	40/6xd.	+1/-	3 19 0
County of London	1	10½	10½	50/-xd.	+6d-	4 4 0
Edmundson's 7% Pref.	1	7	7	33/6	—	4 3 7
Do. Ord.	1	8	9	39/-	—	4 12 4
Elec. Dis. Yorkshire	1	9	9	41/-	—	4 7 10
Elec. Fin. and Securities	1	12½	12½	2½	—	4 13 0
Elec. Supply Corporation	1	11	12	52/6	—	4 11 5
Lancs Light and Power	1	7½	7½	34/-	—	4 8 3
Lond. Assoc. Electric	1	—	7	31/3	—	4 9 6
London Electric	1	7	8	35/6	—	4 10 2
London Power Deb. Red.	Stock	5	5	105½	—	4 14 9
Metropolitan	1	10	10	46/-	—	4 7 0
Midland Counties	1	7½	8	38/-	—	4 4 8
Mid. Elec. Power	1	8	9	2½	—	4 7 5
North Eastern Electric Ordinary	1	6	7	32/6xd.	+6d.	4 6 2
Do. 7% Pref.	1	7	7	34/-xd.	—	4 2 4
Northampton	1	10	10	46/3	—	4 6 7
Notting Hill 6% Pref.	10	6	6	14	—	4 5 9
North Met. Elec. Ordinary	1	10	10	49/3	—	4 1 2
Do. do. 6% Pref.	1	6	6	30/6	—	3 18 8
Scottish Power	1	8	8	37/6	—	4 5 4
South London	1	7	7	32/-xd.	+6d.	4 7 6
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	23/-xd.	+6d.	6 10 5
Yorkshire Elec.	1	8	8	39/6	—	4 1 1
PUBLIC BOARDS.						
Central Electricity, 1950–70	Stock	5	5	113	—	4 8 6
Do. 1955–75	,,	5	5	115	—1	4 7 0
Do. 1951–73	,,	4½	4½	109	—	4 2 7
Do. 1963–93	,,	—	3½	97½	—	3 11 10
London Elec. Trans. Gtd	,,	—	2½	86	—	2 18 1
London & Home Counties, 1955–75	,,	4½	4½	111	+2	4 1 1
London Passenger Transport, A	,,	—	4½	113½	—	3 19 4
Do. do. B	,,	—	5	117½	—	4 5 1
Do. do. C	,,	4	4	81½	—½	4 18 2
West Midlands Joint Elec. 1948–68	,,	—	5	110½	—1	4 10 8
TELEGRAPH AND TELEPHONE.						
American Tel. & Tel.	$160	9	9	167½	−2	5 8 1
Anglo-Am. Tel. Pref.	Stock	6	6	121½	—1	4 18 9
Do. Def.	,,	1½	1½	29½	—	5 1 8
Cable & Wireless 5½% Pref.	,,	4½	5½	105	—1	5 4 9
Do. Ord.	,,	—	—	80½	−2	—
Do. Income	,,	—	—	101½	—	3 18 10
Globe Tel. & Tel. Ord.	10	4½*	5½*	16¾xd.	+½	3 5 2
Do. do. Pref.	10	6	6	14¼xd.	+½	4 5 9
Great Northern Tel.	10	20	20	42	—	4 15 3
Marconi-Marine	1	10	7½	37/6	—	4 0 0
Oriental Telephone Ord.	1	12*	12*	3½	—	3 16 10
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	5/-	—	—
Do. do. 2nd Pref.	5	Nil	Nil	3/9	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	20½	—1	—
British Electric Traction Def. Ord.	,,	5	5	1200	−50	—
Do. do. Pref. Ord.	,,	8	8	168	—	4 15 5
Brazil Traction	$100	40 cts.	50 cts.	22½	—3	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	105½	—	4 14 9
Mexican Light Common	$100	Nil	Nil	2	—	—
Do. 1st Bonds	$500	5	5	33	—	—
Victoria Falls Ord.	1	20	12	66/3	—	3 12 6
West Riding	1	6½	10	43/9	—	4 11 4
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	15	15	2½	—	6 0 0
Assoc. Elec. Ord.	1	8	10	49/6	—	4 0 8
Do. Pref.	1	8	8	37/6	—	4 5 3
Babcock & Wilcox	1	8	10	47/6	−1/-	4 4 2
British Aluminium Ord.	1	7½	10	55/-	—	3 12 9
British Insulated Ord.	Stock	20	20	4¾	−¼	4 2 0
Brush Ord	Stock	Nil	Nil	47½	−1½	—
Callender's	1	15	15	4⅛	—	3 2 3
Do. 6½% Pref.	1	6½	6½	31/3	—	4 2 4
Crompton Parkinson Ord.	5/-	12½	12½	2¾	−⅛	—
Do. 8% Pref.	1	8	8	37/6	—	4 5 4
Electric Construction	1	7	10	2½	—	4 14 1
Enfield Cable Ord.	1	25	25	5½	—	4 8 0
English Electric	1	Nil	Nil	35/-	—	—
Do. do. Pref.	1	6½	6½	26/6	—	4 18 1
Ericsson Tel.	5/-	20	25	2½	—	2 7 6
Ever Ready	5/-	35	45	31/6	−6d.	7 2 8
Ferranti Pref.	1	7	7	27/6	—	5 1 10
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	15	17½	86/-	—	4 1 4
Henley's	5/-	30	15	20/6xd.	—	3 13 2
Do. 4½% Pref.	1	4½	4½	1½	—	4 0 0
India-Rubber Pref.	1	5½	5½	21/3	—	5 3 6
Johnson & Phillips	1	7½	10	46/3	—	4 6 6
Lancashire Dynamo	1	10	20	3⅛	—	5 8 4
Siemens Ord.	1	6	7½	34/6	—	4 7 0
Telegraph Construction	£1	Nil	7½	2⅝	—	2 17 2

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1935

28779. "Electric fuses." E. Wilcox and E. Wilcox & Co., Ltd. October 19th, 1936. (470327.)

1936

675. "Suppression of radiated electrical interference." A. G. Haslam, E. G. Cropper, D. H. A. McKenzie and Belling & Lee, Ltd. January 8th, 1936. (470396.)

3173. "Call-registering sub-station telephone sets." A. K. Ghosh. February 3rd, 1936. (470332.)

3800. "Electric immersion heaters." General Electric Co., Ltd., and O. W. Humphreys. February 7th, 1936. (470399.)

3823. "Method of effecting the winding of dynamo-electric machines." M. Sigmund. July 20th, 1935. (470256.)

3930. "Electron-discharge devices." Marconi's Wireless Telegraph Co., Ltd., and L. M. Myers. February 8th, 1936. (470102.)

4033. "Automatic directional electrical signals for traffic control." R. Bird. February 13th, 1935. (470184.)

4052. "Cathode-ray tubes and like electron-discharge devices." Fernseh Akt.-Ges. February 8th, 1935. (470186.)

4093. "Insulated fishplates." L. Wynn-Williams. February 11th, 1936. (470262.)

4193. "Electrically propelled road vehicles." J. P. Garner. February 12th, 1936. (470463.)

4332. "Television and like apparatus." Baird Television, Ltd., and J. L. Baird. February 13th, 1936. (470347.)

4399. "Electrical testing apparatus." A. G. De Grey, Allied Motor Components, Ltd., and P. B. Lewis. February 13th, 1936. (470189.)

4420. "Electric signal transmission lines." A. D. Blumlein. February 13th, 1936. (470408.)

4536. "Adjustable supporting arms for electric lamps." H. A. Stock and A. J. Wilmot. February 14th, 1936. (470414.)

4582. "Carrier-wave modulation systems." Marconi's Wireless Telegraph Co., Ltd., N. H. Clough and E. Green. February 14th, 1936. (470421.)

4643. "Apparatus for rectifying alternating currents." General Electric Co., Ltd., and C. R. Dunham. February 15th, 1936. (Cognate application 7524/36.) (470351.)

4801. "Electric junction boxes or the like." General Electric Co., Ltd., F. G. Quance and H. W. Cron. February 17th, 1936. (470278.)

4995. "Enclosed electric switchgear." Walsall Conduits, Ltd., A. E. Millard and R. A. B. Court. February 19th, 1936. (470191.)

5749. "Apparatus for obtaining high-tension alternating current from low-tension direct current." R. J. Elsome-Jones. February 26th, 1936. (470429.)

5990. "Electric heating elements." C. Sykes, W. Needham and Metropolitan-Vickers Electrical Co., Ltd. February 28th, 1936. (470108.)

6658. "Electro-magnet interrupters." Ericsson Telephones, Ltd., and L. S. Distin. March 5th, 1936. (470355.)

6848. "Separator boxes for electric wiring installations." H. M. Wood. March 6th, 1936. (470357.)

7594. "Electrical separation of suspended particles from gaseous fluids." Lodge-Cottrell, Ltd., and L. Lodge. March 13th, 1936. (470115.)

8944. "Wire broadcasting systems." R. E. H. Carpenter and P. P. Eckersley. March 25th, 1936. (470286.)

10817. "Domestic and like electric-wiring installations." Siemens-Schuckertwerke Akt.-Ges. April 15th, 1935. (470121.)

12548. "Electrical means for indicating relative movements of parts of aircraft." S. Smith & Sons (Motor Accessories), Ltd., and V. J. S. Russell. May 4th, 1936. (470200.)

13393. "Apparatus for transmitting and receiving radio signals." E. K. Cole, Ltd., and E. Garthwaite. May 12th, 1936. (470366.)

14209. "Frequency-reducing systems." Associated Electric Laboratories, Inc. June 3rd, 1935. (470128.)

14442. "Apparatus for producing large impulses of electrical energy of short duration." Vertriebs-Ges. des Leipziger Leichtmetall-Werk. May 22nd, 1935. (Addition to 432041.) (Cognate application 14443/36.) (470129.)

14566. "Direct electric current traction equipments arranged for regenerative braking." W. T. Gray and Metropolitan-Vickers Electrical Co., Ltd. May 22nd, 1936. (470203.)

16035. "Modulated carrier-wave receivers." Marconi's Wireless Telegraph Co., Ltd. June 6th, 1935. (470131.)

16978. "Magnetic scanning in cathode-ray tubes." General Electric Co., Ltd., and R. J. Dippy. June 18th, 1936. (470300.)

17111. "Means for suppressing radio-interference from electric-discharge devices." General Electric Co., Ltd., N. R. Bligh and H. G. Lillicrap. June 19th, 1936. (470301.)

18752. "Process and device for the reproduction of designs on printing plates by means of photo-electrically controlled gravers." F. Alice. July 5th, 1935. (Cognate application 18753/36). (470435.)

18952. "Photo-electric photometers." Weston Electrical Instrument Corporation. August 16th, 1935. (470134.)

19553. "Electric-discharge lamps containing luminescent materials." General Electric Co., Ltd. (Patent-Treuhand Ges. für Elektrische Glühlampen.) July 14th, 1936. (470302.)

19904. "Electric-discharge devices with external cooled anodes." M.-O. Valve Co., Ltd., and R. Le Rossignol. July 17th, 1936. (470212.)

19937. "Metal-clad switchgear." D. R. Davies, and Metropolitan-Vickers Electrical Co., Ltd. July 17th, 1936. (470213.)

20212. "Circuit arrangements for measuring a component of an alternating current or an alternating potential." Siemens and Halske Akt.-Ges. August 3rd, 1935. (470303.)

22496. "Operation of electric tramway and railway points." W. Reid and W. M. Little. August 15th, 1936. (470215.)

24738. "High-frequency electric measuring appliances." J. T. Shevlin (Siemens and Halske Akt.-Ges.). September 10th, 1936. (470308.)

25997. "Reduction of interference in electric signal transmission systems." W. S. Percival. November 8th, 1935. (Divided out of 30991/35.) (Cognate application 10595/36.) (470140.)

29059. "Electric transformers." British Thomson-Houston Co., Ltd. October 25th, 1935. (Cognate applications 29060/36, 29061/36 and 29062/36.) (470145.)

30044. "Sound signal transmission systems." Telefunken Ges. für Drahtlose Telgraphie. November 4th, 1935. (470148.)

31047. "Electrically heated vulcanisers." Dill Manufacturing Co. January 9th, 1936. (470150.)

33466. "Wireless aerials." J. Kastl (trading as Castelco Fabrik für Elektrische Apparate und Metallwaren Inhaber J. Kastl). December 6th, 1935. (470155.)

34857. "Automatic phase-distortion correcting system for carrier-wave signalling systems." Standard Telephones & Cables, Ltd. February 21st, 1936. (470158.)

35257. "High-frequency electric signal selecting systems." Hazeltine Corporation. January 28th, 1936. (470450.)

1937

425. "Navigation-aiding radio transmitters." Telefunken Ges. für Drahtlose Telegraphie. January 6th, 1936. (470165.)

618. "Terminal boxes for telephone and telegraph cables." Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.). January 8th, 1937. (470369.)

1723. "High-voltage electrode housings, particularly for neon and like luminous tubes." Corning Glass Works. January 20th, 1936. (470229.)

1984. "Radio and like receivers." Telefunken Ges. für Drahtlose Telegraphie. January 22nd, 1936. (470372.)

2382. "Sparking plugs." Soc. Francaise la Bougie Double. February 7th, 1936. (470374.)

2500. "Electron-discharge tubes and methods of manufac turing such tubes." C. Lorenz Akt.-Ges. January 28th, 1936. (Cognate application 2501/37.) (470375.)

3444. "Galvanic batteries." Chloride Electrical Storage Co., Ltd. March 31st, 1936. (470233.)

3724. "Carbon-coated electrodes or the like in electric-discharge lamps." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. February 10th, 1936. (470234.)

5851. "Thermionic valves." Soc. Francaise Radio-Electrique. February 26th, 1936. (470238.)

6533. "Electric accumulators." Chloride Electrical Storage Co., Ltd. June 8th, 1936. (470240.)

6823. "Electric insulating materials for conductors and the like." British Thomson-Houston Co., Ltd. March 7th, 1936. (470380.)

8539. "Insulated electric conductors." British Thomson-Houston Co., Ltd. March 24th, 1936. (470244.)

14264. "Electrical switch-fuse combinations." J. A. Crabtree & Co., Ltd., and H. F. McLoughlin. February 15th, 1937. (Divided out of 1141/36.) (470453.)

14585. "Insulated fishplates." L. Wynn-Williams. February 11th. 1936. (Divided out of 470262.) (470324.)

16259. "Cathode-ray tubes." Baird Television Ltd., and J. L. Baird. February 13th, 1936. (Divided out of 470347.) (470480.)

18728. "Mechanical and electrical coupling." A. F. W. Richards and H. Bright. January 11th, 1936. (Divided out of 944/36.) (470384.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from September 1st.

Resicord. No. 577432. Class 6. Parts of machinery made wholly or principally of fibrous material impregnated with hardened synthetic resin.—Bakelite, Ltd., 68, Victoria Street, Westminster, S.W.1.

Titan. No. 574117. Class 13. Electric lamps (ordinary).—Atlas Lamp Works, Ltd., 195, Judd Street, King's Cross, W.C.1.

Morco (lettering and design). No. 576938. Class 18. Electric and pneumatic bell systems, &c.—T. B. Morley & Co., Ltd., Liberty Chambers, Jameson Street, Hull.

Switchgear Fault at Atherton

WE recently reported an interruption in the supply of electricity from Atherton power station, due to switchgear failure. The South Lancashire Transport Co. says that at 3.40 p.m. on August 24th, the insulation on a compound-filled current transformer on the generator side of the switch of a 5,000-kW machine operating on load in parallel with the grid broke down. The faulty transformer was mounted inside and the oil circuit-breaker outside a moulded stone cubicle, in a separate room from the turbine house, from which the breaker was operated by remote electrical control. The switchgear was on a two-phase three-wire system, 50 cycles, 7.5 kV phase-to-neutral, and fitted with gear designed for 11 kV. The oil circuit-breaker was opened by its protective gear, but arcing to the switch tank occurred. The oil vapour emitted from the vents was ignited and an explosion resulted in the glass in the roof immediately above the cubicles being blown out. The fire was immediately extinguished by the staff with CO_2 apparatus, but the dangerous state of glass in the roof necessitated this being cleared before the full extent of the damage could be investigated. The damage having spread to other breakers, each equipment had to be inspected before passing it as fit for service. Immediately this was completed and the faulty apparatus isolated, the supply was resumed from the Central Electricity Board's system. The supply was interrupted from 3.40 p.m. to 5.23 p.m. Little damage was done to the building.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Barking (ESSEX).—School, Sandringham Road, Manor Farm estate; H. H. Dawson & H. W. Allardyce, architects, Clock House Chambers.

Beckenham.—Cinema, with shops, Croydon Road; Harris & Gillow, 80, Wardour Street, London, W.1.

Birkenhead.—Houses (128), Challis Street; A. H. Lee & Sons, Ltd. Houses (186), Woodchurch estate (£91,750); Lloyd & Cross, Ltd. Flats (66), Village Road; W. M. & M. W. Shennan. Central health premises; borough engineer.

Birmingham.—Cinema, Longbridge, for Danilo Cinemas Co.; E. S. Roberts, architect, Lombard House, Great Charles Street. Factory premises, Pershore Street; Sapcote & Sons, builders, Camden Street. Factory, Webb Lane, near Highfield Road, Hall Green; Wm. Wilkinson, Ltd., builders, Hutton Road, Birmingham. Office and warehouse block, for R. Lunt & Co., Old Square; B. Whitehouse & Sons, builders, Monument Road, Birmingham. Police station, Bridge Street West; H. J. Manzoni, surveyor, Council House. School, Cockshut Hill (£34,750), for E.C. Additions to mills, C. Clifford & Sons, Fazeley Street; S. G. Jones, builders, 178, Victoria Road. Additions to works, H. C. Webb & Co., Ltd., Tame Road, Witton; James Moffatt & Son, builders, South Road, Birmingham.

Blackpool.—Houses (63), Poulton Road; R. Fielding & Son. Houses (23), St. Leonard's Road; E. Topping. Houses (20), Toronto Avenue; J. B. Brierley. Cinema, Dickson Road; Odeon, Ltd. Premises, Corporation Street, for Boots' Chemists, Ltd. Houses (17), Preston New Road; Ramsden Bros., Ltd. Rebuilding, 208-210, Church Street; J. Bonny.

Bolton.—Extensions to Fishpool Institution (£91,265); borough engineer.

Bucknall (STAFFORDSHIRE).—Estate development, near Fellbrook Lane; Northmere Building Co.

Burton-on-Trent.—Reconstruction of Market hall (£5,976); borough engineer.

Cambridge.—Extensions to Newnham College (£100,000), for the Senate of Cambridge University; Scott Chesterton & Shepherd, architects, 12, York Buildings, Adelphi, London, W.C.2

Chelmsford.—Houses (36), Widford estate (£13,890); Tyler & Dobie, Ltd.

Cheltenham.—Houses (28), Arle Road; Western Estates. Houses (42), Naunton Way; Cheltenham Estates, Ltd. Block of flats, Cambray House; John Davis Estates. Shops, Cleevemount estate; G. A. M. Hall, Ltd.

Chorley.—Houses (96) and shop, Great Knowley estate; J. W. Lee, builder, Yarrow Road.

Darlington.—Houses (130), Geneva Road East and Geneva Road West; borough engineer.

Didcot.—Hospital; Rev. D. J. Amies.

Doncaster.—Cinema, Oswin Avenue and Warmsworth Road, Balby, for the Suburban Cinemas (North Midlands), Ltd.; J. H. Metcalfe, builder, 62, Cunningham Road. School, Waverley, for E.C.; Walker & Thompson, architects, Carbon Chambers, Hall Gate.

Dover.—Houses (161), St. Radigund's Road (No. 3) and Bunker's Hill housing estates; borough engineer and surveyor, Maison Dieu House, Dover.

Droitwich.—Methodist Church, Worcester Street; Spicers (Builders), Ltd., Pembury Street, Worcester.

Dunfermline.—Houses (42), Parkneuk Road (electrical work); D. H. Shaw, burgh engineer, City Chambers.

Gateshead-on-Tyne.—Hotel, Durham Road, for Ind Coope & Allsopp, Ltd.; W. Norman, builder, West Lane, Chester-le-Street.

Glasgow.—Extensions to Hawkhead hospital (£23,300); city engineer.

Greenock.—Extensions to premises of Greenock Central Co-operative Society, Ltd. (£35,000), Central Chambers, Roxburgh Street.

Hailsham (SUSSEX).—Development of Ratton estate; Ratton Estate (Eastbourne), Ltd.

Hampshire.—School, Alton; County E.C.

Handsworth (BIRMINGHAM).—Houses (273), Friary estate, Friary Road; A. Silverstone & Co., New Street, Birmingham.

Harpenden.—Public hall (£19,000), Southdown Road; R. Ginn & Son, builders, St. Andrew's Works, Hertford.

Hemel Hempstead.—School, Crabtree Lane (£53,560), for E.C.

Heston.—Offices and clinics (£26,625); Heston & Isleworth borough engineer.

Hove.—Houses (4,000), Hangleton estate, Lark Hill; Braybons, Ltd., builders, North Street, Brighton. Houses, Poplar Avenue; H. L. Ford. Houses (20), Winchester estate; E. C. H. Jays.

Huddersfield.—Female ward block, Bradley Wood Sanatorium; borough engineer and surveyor, High Street Buildings.

Hull.—Cinema, Deringham Bank; Pennington Hustler & Taylor, architects, 45, Ropergate, Pontefract.

Illogan (REDRUTH).—Houses, Killiers Fields (£24,710); T. F. King, U.D.C. surveyor.

Inverbevie.—Premises, King Street, for the Brechin United Co-operative Society.

Irish Free State.—(DUBLIN).—Houses (444), Crumlin South housing area; H. G. Simms, housing architect, 3, Parliament Street.

Jarrow-on-Tyne.—Extensions to premises, Montague Burton, Ltd., Ormonde Street.

Keighley.—Houses (50), Westbourne estate; D. Fortune, builder, Rocklyn, Oakworth Road.

Kent.—Schools, Swanscombe; county architect.

Lanchester.—Houses for aged people; R.D.C. surveyor.

Leeds.—Cinema for the Odeon (Leeds), Ltd., Woodhouse Lane.

Leith.—Houses (20), Hermitage Park; Thomas Millar & Co., builders, Hermitage Park.

Liskeard.—Houses (22); E C. Higman, architect, Barras Street.

Liverpool.—Police training school (£86,972); Unit Construction Co., Ltd., Rocky Lane, Old Swan, Liverpool, 14.

Macclesfield.—Houses (30), Lower Park Road, Poynton; P. Clayton & Son, Dickens Road, Poynton.

Maidstone (KENT).—Houses (107), Coombe Farm housing estate; T. F. Bunting, borough surveyor, Palace Avenue.

Middlesex.—Additions and alterations to Stationers' Company's school, Hornsey (£41,553); director of education, 10, Great George Street, London, S.W.1. School, Hendon, for E.C.

Netley (HAMPSHIRE).—Cinema, Victoria Road; E. Dunkels.

Northampton.—Houses (25), Delapre estate; Acme Building Co. Houses (84), Fullingdale Road; Lucas (Moulton), Ltd. Houses (120), Thornton Road; T. Wilson & Son. Nurses' Home (£30,000), for the Northampton General Hospital Board of Management; secretary.

Northfield.—Block of shops, Bristol Road South, for Healy & Baker, 29, George Street, Hanover Square, London, W.1.

Ogwen (BANGOR).—Houses (62); R. T. Jones, clerk, Midland Bank Chambers, Bangor, Caernarvonshire.

Oldbury.—Houses (58), Warley and Pencricket Lane; borough surveyor, Municipal Bank Chambers, Oldbury.

Oldham.—Premises for David Burman, York House, Yorkshire Street; C. T. Taylor, Roberts & Bowman, architects, 10, Clegg Street.

Ombersley (WORCESTER).—School, for Ombersley School Governors and Managers; H. Rowe & Son, surveyors, 38, Foregate Street, Worcester.

Plymouth.—Houses (106) and flats, Peters Park estate (£51,634); Building & Public Works Construction Co., Ltd., Swindon. Houses (88), Colebrook Road; Taylor Woodrow Estates, Ltd.

Rawmarsh.—Houses (98), Green Lane estate; J. R. S. Creighton, architect, Council Offices, Parkgate, Yorkshire.

Scarborough.—Offices, Hanover Road; Scarborough Building Society.

Seaford (SUSSEX).—Houses (106), Vale Road; E. Sykes, U.D.C. surveyor, Municipal Offices.

Sheffield.—Houses (34), Grimsthorpe Road; J. Samuel. Houses (24), near Richmond Road; J. H. Judge & Co. Laboratory, City General Hospital (£26,000); city architect. Houses (30), Lyminster Road; D. Hurrell.

Southport.—Cinema, Lord Street; R. P. Wood.

Stockport.—Houses (194), Walnut Tree Farm site, and school, Avondale Road, for E.C.; borough surveyor.

Sunderland.—Houses (1,062), Plains Farm estate; North-Eastern Housing Association, Northumberland Road, Newcastle-on-Tyne.

Swinton.—School, Cromwell Road, Pendlebury; Ralph, Son & Proude, architects, Leaders Buildings, King Street, Wigan.

Tynemouth.—Flats, Queen Street; borough engineer.

Wallasey.—Houses (23), Rowson Street; Fernhill Estate Co. School, East Way, Moreton (£28,243), with electrical work; Smith & Co., builders, Hoylake.

Wood Green.—School, White Hart Lane; borough surveyor, Town Hall.

Yorkshire.—Schools, Redcar, and Dormanstown, for North Riding E.C., Northallerton. Technical institute and senior school, at the junction of Waggon Lane and main Bradford Road, Bingley (£82,000), for West Riding C.C.; county architect, Wakefield.

High-voltage Transmission in Paris

A new 60-kV feeder to supplement the network in the western suburbs of Paris and in Versailles has recently been put into service. Between the existing sub-station at Billancourt and a new one at Porchefontaine, near Versailles, 11.3 km. of two sets of single conductor 150 sq. mm. cables is run in concrete troughs. The Porchefontaine sub-station contains two 10,000-kVA 60/15 kV transformers controlled, as are the incoming and outgoing feeders, by 600-A, 1,500,000 kVA remote electrically operated circuit-breakers with double bus-bars in two sections coupled by manually operated switches. The 15-kV gear is of the indoor type and incorporates three sets of bus-bars in three sections, one serving the Sud Lumière, a second the Versailles Co., and the third the Ouest Lumière Co. One 60-kV, 100 sq. mm. cable is taken on to Montigny, 8¾ km. away. Joints on the first section are 250 metres apart and on the second twice that distance. Attempts to rewind the insulation mechanically when making joints were not so successful as hand winding. At Montigny the cable is brought up to pot heads for connecting to an overhead line, which will later be duplicated when another cable is run. The conductors of this line are 94 sq. mm. and are supported by strings of five and six insulators. The 48-sq. mm. ground wire is at the top of the trellis-type towers, which have a normal span of 250 metres. For the last 620 metres before the Montfort sub-station transmission is underground and terminates at a single set of bus-bars. The 600-A oil-circuit-breakers, which have a rupturing capacity of 75,000 kVA, control two 60/45.5-kV delta-star, 5,000 kVA transformers.